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**BULLETINS
OF
AMERICAN PALEONTOLOGY**

Vol. 13

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SOME VENEZUELAN AND CARIBBEAN MOLLUSKS

BY

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AND

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October 7, 1927

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INTRODUCTION

The collections upon which this article is based were made in Venezuela for an American company. Only descriptions of species with general localities and general ages can be given at present, but later, when the interests of the company permit, we hope to publish definite localities and stratigraphic ranges for the species.

The species referred to "Williston MS." in the text are adapted from the unpublished manuscript of Mr. S. H. Williston, formerly with the Venezuelan Sun Company. Mr. Williston's manuscript consists of descriptions and figures of specimens collected in the State of Falcón, Venezuela, and was written at Cornell University in the summer of 1923. Where his specimens have been figured in the plates, acknowledgment is made.

Acknowledgments are due especially to Dr. Katherine Van Winkle Palmer and Dr. Pearl G. Sheldon for their help in sorting the Veneroids and Arcas, respectively, and in comparing them with described forms.

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DESCRIPTION OF SPECIES

Class PELECYPODA Goldfuss

Family PARALLELODONTIDÆ Dall

Genus CUCULLÆA Lamarck

Cucullæa perijana F. and H. Hodson, n. sp. Pl. 1, figs. 1, 3, 5.

Shell small, subquadrate, very inflated, higher than long, not produced posteriorly. The beaks are high, incurved over the narrow, short, ligamental area, which is somewhat wider behind the beaks; the ligamental area shows faint grooves parallel to the hinge line. The posterior part of the beaks is flattened and continuous with the flattened posterior end of the shell; the projection of the hinge line into the flattened end forms an elevation. The anterior ends of the valves are rounded. Both valves are ornamented with close-set concentric lines crossed by radials of about equal prominence; microscopically, the sculpture is closely reticulate. The superior edge of the hinge is straight and practically at right angles with the almost vertical anterior and posterior margins; the ventral margin is almost parallel to the hinge line. The central part of the hinge line is slightly narrower and carries short, close-set, vertical, taxodont teeth. Toward the ends of the hinge line, the teeth become increasingly oblique. The muscle scars are large, rounded, and impressed.

Age: Upper Cretaceous.

Locality: District of Perijá, State of Zulia, locality number 2220.

Genus PSEUDOCUCULLÆA Solger

Pseudocucullæa parijana Harris, F. and H. Hodson, n. sp.

Pl. 1, fig. 4; pl. 2, figs. 1, 3, 4; pl. 3, fig. 1.

Shell rather large, produced posteriorly and slightly gaping anteriorly. The cardinal area is marked by chevron-shaped grooves. The hinge plate is curved and rather heavy. The dentition consists of an anterior series of 3 or 4 parallel teeth elongated in the direction of the hinge plate and separated from a central taxodont series, under the

beak, by a smooth area near the anterior third of the hinge. The central taxodont series forms the central part of the hinge, and is composed of teeth about vertical to the direction of the hinge plate; these become more oblique toward each end; this series terminates anteriorly a little in front of the beak and posteriorly grades into the posterior laterals. In the right valve, the posterior laterals consist of one strong lateral, with a smaller, lamellar, parallel one above it, and a shorter, strong, parallel, interior lateral near the muscle scar. The sculpture consists of close-set concentric lines, crossed by fainter radials.

Age: Upper Cretaceous.

Locality: District of Perijá, State of Zulia, locality number 2220.

Family ARCIDÆ Dall

Genus ARCA Linné

As the subgenera of *Arca* intergrade very closely, they have been considered here as of only subgeneric rather than of generic rank.

Subgenus ARCA s. s.

Arca (Arca) occidentalis Philippi

Arca occidentalis Philippi, 1847, Abbild. u. Besch., 3, p. 14, pl. 17b, fig. 4 a-c.

Arca occidentalis Philippi, Dall, 1898, Trans. Wagner Free Inst. Sci. Philadelphia, vol. 3, pt. 4, p. 620.

Arca occidentalis Philippi, Sheldon, 1916, Paleont. Amer., vol. 1, p. 8, pl. 1, figs. 8-11.

Arca occidentalis Philippi, Maury, 1917, Bull. Amer. Pal., vol. 5, p. 327, pl. 55, fig. 3.

Arca occidentalis Philippi, Olsson, 1922, Bull. Amer. Pal., vol. 9, no. 39, pp. 181-182, pl. 22, fig. 1.

Arca occidentalis Philippi, Maury, 1925, Bull. Amer. Pal., vol. 10, no. 42, pp. 34-35, pl. 1, figs. 1, 2.

Arca occidentalis Philippi, Woodring, 1925, Carnegie Inst. of Washington, publication number 366, pp. 29-30, pl. 2, figs. 8, 9.

This is not an abundant fossil species in Venezuela.

Age: Miocene-Recent.

Locality: Districts of Colina, Democracia and Falcón, State of Falcón; Ter, Delta Amacuro; recent along the Falcón coast; locality numbers 185, 1033, 1131, 1504, 1818.

Arca umbonata pæzensis H. K. Hodson, n. subsp. Pl. 1, fig. 7.

In the Quaternary, along with *A. umbonta* Lamarck, is a larger form which seems to be a subspecies. It is not only larger, but has many fine riblets between the main longitudinal ribs, especially on the anterior.

Age: Quaternary.

Locality: District of Paéz, State of Zulia, locality number 526.

Subgenus NOETIA Gray

Arca (Nætia) macdonaldi Dall

Arca (Nætia) macdonaldi Dall, 1912, Smithsonian Miscellaneous Collections, vol. 59, no. 2, p. 9.

Arca MacDonaldi Dall, Olsson, 1922, Bull. Amer. Pal., vol. 9, no. 39, pp. 194-195, pl. 25, figs. 4-5.

Arca (Nætia) macdonaldi Dall, 1925, Proc. U. S. Nat. Mus., vol. 66, p. 5, pl. 17, fig. 9.

The specimens from Venezuela are very poorly preserved; the shells are broken and frequently replaced and thickened with gypsum. They are apparently specifically identical to the Costa Rican form; they show an area of variable width as mentioned by Olsson, and have much the same trigonal shape as shown by Dall's figure of the type. Two of our specimens from Gatun seem typical of the species and almost identical with Dall's figure.

Age: Miocene.

Locality: District of Democracia, State of Falcón, locality numbers 1792, 2255, 2267; Gatun Spillway, Gatun, C. Z.

Subgenus SCAPHARCA Gray

Section SCAPHARCA s. s.

Arca (Scapharca) wiedenmayeri H. K. Hodson, n. sp. Pl. 1, figs. 2, 6.

The shell is rather rectangular, inflated, only slightly produced posteriorly. It is ornamented with about 32 ribs, which are about equal in width to the interspaces. The ribs of the right valve are slightly narrower and smoother than those of the left; the ribs of both valves are somewhat narrower in the center. On the left valve, the ribs are

rather strongly nodose and bifurcate; posteriorly, they become less noded and carry secondary longitudinal lines. The beaks are full, medially sulcate, situated at about the anterior fourth of the shell. The cardinal area is lanceolate and bears about three lozenge-shaped grooves. The teeth and interior cannot be seen as all of the specimens consist of two valves fastened together.

Named in honor of Dr. C. Wiedenmayer, who collected the material.

Age: Oligocene.

Locality: District of Buchivacoa, State of Falcón, locality number 2447.

Arca (*Scapharca*) *zuliana* H. K. Hodson, n. sp. Pl. 4, figs. 7, 8, 10.

The shell is small, high, so tumid that a whole shell of two valves is about as thick as long, flattened behind the beaks, slightly produced posteriorly. The beaks are medially sulcate, posteriorly keeled, situated at about the anterior fourth of the whole length of the shell. There are 36-41 undivided ribs, crossed by growth lines which ornament them with knobs; the interspaces are wider than the ribs. The ribs of the right valve are narrower than those of the left, and separated by wider interspaces. The internal margin is deeply fluted in harmony with the external ribbing. The ligamental area extends slightly more than half the length of the shell, and bears about 5 chevron-shaped grooves. The teeth are vertical, straight, and arranged in an almost uninterrupted series with about 20 anterior and 28 posterior.

The adults are easily distinguished from other species by being proportionately higher, flattened posteriorly, and very tumid. From *A. zuliana maracaibensis* (n. subsp.), it is distinguished by its longer teeth, somewhat shorter hinge line and less produced posterior.

Age: Oligocene-Miocene.

Locality: District of Miranda, State of Zulia; District of Buchivacoa, State of Falcón; locality numbers 6, 2040 (*cf.*).

Arca zuliana maracaibensis H. K. Hodson, n. subsp. Pl. 4, figs. 9, 11.

This subspecies is distinguished from *A. zuliana* (n. sp.) by being more produced posteriorly and having a somewhat longer hinge line. The teeth are fewer, shorter, somewhat bent, more widely spaced; the series is narrower at the center and wider at the ends. There are all intergradations between the species and subspecies.

Age: Oligocene-Miocene.

Locality: District of Miranda, State of Zulia; District of Acosta, State of Falcón; locality numbers 6, 1415.

Arca (Scapharca) weeksi H. K. Hodson, n. sp. Pl. 4, figs. 4, 6.

The shell is high, small, inflated, ornamented with about 32 ribs. On the right valve, these ribs are a little wider than the interspaces and are knobbed. On the left valve, the ribs are noded only on the anterior and are about equal in width to the interspaces. The beaks are inflated and situated a little in front of the anterior fourth of the shell. The cardinal area is not large and carries about 2 chevron-shaped grooves. The teeth are long, close-set, and arranged in a scarcely interrupted series with about 14 anterior and 20 posterior. The inner margin is fluted in harmony with the external ribbing.

This shell is very close to *A. zuliana* (n. sp.), but there is no characteristic identical in the two species. *A. weeksi* (n. sp.) is smaller, has about 10 less ribs, is more irregularly shaped, has fewer teeth, fewer chevron-shaped grooves on the cardinal area, and narrower beaks.

Named in honor of Mr. L. G. Weeks, who collected the specimens figured.

Age: Oligocene-Miocene.

Locality: District of Buchivacoa, State of Falcón; District of Bolívar, State of Zulia; locality numbers 1943, 2420 (? large), 3222, 3250, 4619.

Arca (*Scapharca*) *berjadinensis* H. K. Hodson, n. sp.
Pl. 4, figs. 1, 2, 3, 5.

The shell is small, of variable shape, produced posteriorly and rounded anteriorly. The beaks are high, full, and situated at about the anterior fourth of the shell. The umbonal ridge is distinct throughout its length although toward the margin it becomes more rounded; behind this, the shell is concave. The ventral margin is straight or only slightly curved. The cardinal area is short and wide, occasionally marked with a few chevron-shaped grooves. The teeth are divided into two series, the anterior is more crowded and shorter, the posterior longer and more curved at the end. Most of the valves carry about 28 ribs, about 10 of which are behind the umbonal ridge; they are separated by interspaces only slightly narrower than the ribs, although on the anterior and in gerontic specimens, the interspaces are equal to or wider than the ribs. Rather strong nodes cover the ribs except near and on the umbonal ridge; here the ribs are noded only in the very young stages; if any nodes at all occur posterior to the umbonal ridge, they are found up near the cardinal area and are weak. The nodes on the left valve seem to be slightly stronger than those on the right. The inner margin is deeply fluted in harmony with the external ribs. Very large, gerontic specimens measure about 22 mm. in height, 26 mm. in length and 19 mm. in diameter (2 valves); these are very produced posteriorly and carry a few chevron-shaped grooves on the cardinal area. Average adult specimens measure about 14 mm. in height, 16 mm. in length and 14 mm. in diameter (2 valves).

This species differs from *Arca pittieri* Dall¹ in being smaller, more produced posteriorly, and in carrying fewer nodes on the ribs near the umbonal ridge. *A. lloydi* Olsson² is less produced posteriorly and carries an inter-

¹ Smithsonian Misc. Coll., 1912, vol. 59, no. 2, pp. 9-10.

² Bull. Amer. Pal., 1922, vol. 9, no. 39, pp. 192-193, pl. 24, figs. 10-12.

stitial thread not found in *A. berjadinensis* (n. sp.). The new species is smaller and more produced posteriorly than *A. hindsii* Olsson.¹

A. berjadinensis (n. sp.) is a very common species of *Arca* in Venezuela and varies somewhat in shape, especially in the fullness of the umbones and in the twist of the posterior prolongation.

Age: Miocene.

Locality: Districts of Colina, Buchivacoa and Democracia, State of Falcón, locality numbers 24, 67, 70A, 74A, 75, 79, 82, 83A, 90, 93, 94, 97, 150A, 150B, 184, 185, 187, 193, 193A, 216 (?), 225, 225A, 228, 273, 291, 298, 1000, 1007, 1010 (?), 1064, 1078, 1115, 1210, 1232, 1233, 1800, 1844, 1862, 1869, 1872, 1883, 1900, 1906B, 2036, 2054, 2375, 2377, 2383, 2384, 2391.

Arca grandis waringi Maury

Pl. 7, figs. 1, 4.

Scapharca patricia Sowerby, C. J. Maury, 1917, Bull. Amer. Pal., vol. 5, no. 29, pp. 173-174, pl. 27, fig. 1 (*partim*).

Scapharca patricia waringi Maury, 1925, Bull. Amer. Pal., vol. 10, no. 42, pp. 58-59, pl. 3, figs. 2, 5.

Dr. W. P. Woodring² has examined a replica of the lectotype (selected by Blake and Sherborn) of *A. patricia* Sowerby³ and found it to be equivalent to *A. tolepiæ* Dall⁴ pp. 649-650, pl. 33, figs. 7, 8.

and *A. arthurspennelli* Maury.⁵ As long as this lectotype is considered valid, another name must be used for what has commonly been called *A. patricia*. *A. grandis waringi* seems the only logical name for this group.

In Venezuela, *A. grandis waringi* Maury is a very common and variable species. In Santo Domingo, occurs the larger form, *A. grandis* Sowerby, as has been previously stated by Dr. H. A. Pilsbry⁶; with this is found its sub-

¹ Loc. cit., pp. 193-194, pl. 24, figs. 7-9.

² Science, December 4, 1925, vol. 62, no. 1614, pp. 518-519.

³ Geol. Soc. London Quart. Jour., 1850, vol. 6, p. 52.

⁴ Trans. Wagner Free Inst. Sci. Philadelphia, 1898, vol. 3, pt. 4,

⁵ Bull. Amer. Pal., 1917, vol. 5, p. 342, pl. 55, figs. 9, 10.

⁶ Proc. Acad. Nat. Sci. Philadelphia, 1921, p. 404.

species *waringi* as well as the similar form *A. chiriquensis* Gabb. Trinidad is the type locality for the subspecies *waringi*; Dr. Maury's recorded "*A. patricia*" from there may be *A. grandis* or only one of the numerous intergradations between the species and its subspecies.

The numerous specimens from Venezuela have been carefully compared with fossil specimens from Santo Domingo, recent specimens of *A. grandis*, and Dr. Maury's figures of the Trinidad material. *A. grandis waringi* Maury is a very variable form and the ancestor of the more recent species, from which it differs mainly in its smaller size. It becomes larger and approaches the more recent species more closely as it is found through successively younger beds, with all gradations between the species and the subspecies present.

Age: Miocene and Pliocene.

Locality: Common in the State of Falcón, locality numbers 70, 71, 72, 74, 79, 83, 84, 90, 106, 122, 196, 203, 296, 298, 299, 355, 415, 785, 789 (?), 940, 1020, 1027, 1045, 1064, 1125, 1233, 1252, 1484, 1489, 1859, 1860, 1861, 1862, 1869, 1870, 1871, 1873, 1878A, 1882, 1883, 1885A, 1887, 1892, 1927, 2042.

Arca (Scapharca) saladilloensis H. K. Hodson, n. sp. Pl. 5, figs. 1, 3.

The shell is very small, inflated, high, and posteriorly keeled. The right valve has about 28 ribs, about equal in width to the interspaces, and coarsely noded. The beak is medially sulcate, high, inflated, and situated at about the anterior fourth of the shell. The cardinal area is fairly large and carries a few grooves. The inner margin is fluted in harmony with the external ribbing. The series of teeth is only slightly interrupted with about 21 posterior and 12 anterior teeth; these are long, slender, and only slightly larger at the ends. The right valve has not yet been found.

This small species seems to be adult and is easily distinguished from the young of *A. zuliana* (n. sp.) and of

A. mirandana (n. sp.), with which it is associated, by its stronger posterior keel, narrower beak, coarser nodes on the ribs, and wider denticulations on the inner margin.

Age: Oligocene-Miocene.

Locality: District of Miranda, State of Zulia, locality number 6.

Arca (Scapharca) vueltana H. K. Hodson, n. sp.

Pl. 5, figs. 2, 4, 6.

The shell is very small, round, very round. There are about 25-27 ribs about equal to the interspaces in width, and ornamented with rather coarse nodes; the ribs on the posterior umbonal ridge are smooth and a little more widely separated. The beaks are full and situated at the anterior third of the shell. The cardinal area is of fair size but carries no grooves; it is shaped much like that of *Argina*. The hinge line is somewhat curved posteriorly. The teeth are long and slender and arranged with only a slight interruption; there are about 11 anterior and 16 posterior. The inner margin is crenulated in harmony with the external ribbing.

This *Arca* is rare and usually poorly preserved. It is very small and easily distinguished from other species.

Age: Miocene.

Locality: Districts of Zamora, Democracia, and Colina, State of Falcón, locality numbers 86, 1010, 1335.

Arca vueltana falconensis H. K. Hodson, n. subsp.

Pl. 5, figs. 5, 7, 9.

This subspecies is less inflated than *A. vueltana* (n. sp.), and is more produced posteriorly. The beaks are lower, giving the subspecies a different shape, although the number of ribs, the cardinal area, and hinge line are about the same in the two forms.

Age: Miocene.

Locality: District of Democracia, State of Falcón, locality number 70A.

Arca (Scapharca) buenavistana H. K. Hodson, n. sp.

Pl. 3, figs. 3, 6; pl. 5, fig. 8.

The shell is small, trigonal, produced posteriorly, rounded anteriorly, and carries a sharp umbonal ridge running from the beaks to the margin. The ribs are evenly noded except for the 2 or 3 larger ones on the posterior slope; these, when well preserved, are almost smooth and carry about 5 fine longitudinal ridges; about 10 or 11 of the 32-34 ribs are located on the concave posterior slope. The beaks are full, high, prominent and located at the anterior fourth of the shell. The cardinal area is flat and carries about 6 chevron-shaped grooves. The ribs of the right valve are slightly narrower than those of the left, and the interspaces are correspondingly larger. On the left valve, the ribs are slightly wider than the interspaces except on the anterior; on the right valve almost all of the interspaces are slightly wider. The teeth are arranged in two series, the anterior of which is shorter; at the ends, where the teeth are larger, the hinge line curves down, especially at the posterior. The inner margin is deeply fluted in harmony with the external ribbing.

This species is seldom well preserved. Young specimens resemble *A. berjadinensis* (n. sp.), but the former have a sharper umbonal ridge and a longer, narrower, cardinal area.

Age: Miocene.

Locality: Districts of Colina, Democracia and Acosta, State of Falcón, locality numbers 80, 100, 185, 1033, 1127, 1255, 1450, 1818, 2207.

Arca veatchi matarucana H. K. Hodson, n. subsp. Pl. 3, figs. 4, 5.

This new subspecies is distinguished from *A. veatchi* Olsson¹ by its being more produced posteriorly and by having wider interspaces between the central ribs; in most of the Venezuelan specimens, the cardinal area carries

¹ Bull. Amer. Pal., 1922, vol. 9, no. 39, pp. 189-190, pl. 23, figs. 1-3.

more than 3 grooves. The teeth, the number of ribs, the sculpture, and the fluting of the inner margin, are the same as that of the species.

Age: Miocene.

Locality: District of Colina and Falcón, State of Falcón, locality numbers 122B, 123, 127, 155, 1013, 2207 (very young).

Arca (Scapharca) mirandana H. K. Hodson, n. sp. Pl. 5, figs. 12, 13.

The shell is small, almost elliptical in shape but abbreviated anteriorly, tumid, produced posteriorly. The beaks are medially sulcate and situated a little in front of the anterior fourth of the length of the shell. There are approximately 38 ribs in the smaller shells and 42 in the largest. These are narrow and crossed by concentric growth lines which ornament the central ones on the left valve with small square knobs. The ribs of the right valve are almost smooth and narrower than those on the left. The interspaces are usually wider than the ribs. The inner margin is deeply fluted in harmony with the external ribbing. The cardinal area extends about three-fourths the length of the shell, and usually bears 4 chevron-shaped grooves. The teeth are arranged in a series slightly interrupted posterior to the beak, and curved downward at the ends. In the adults, the teeth number about 25 anterior and 35 posterior, but this varies.

Age: Oligocene-Miocene.

Locality: District of Buchivacoa, State of Falcón; District of Miranda, State of Zulia; locality numbers 6, 1070 (deformed), 1436 (deformed), 1628, 1939, 1951.

Arca (Scapharca) tirantensis H. K. Hodson, n. sp. Pl. 7, figs. 2, 3.

The shell is of medium or small size, inflated, produced posteriorly. The beaks are medially sulcate, high, full, and situated at about the anterior fourth of the shell. It is ornamented with about 33-34 ribs, which are about equal in width to the interspaces. Most of these are bifurcate;

they are widest posteriorly and narrowest in the center. The cardinal area is lanceolate, very deep-set, and slopes down toward the hinge line. On an adult shell, there are about 9 close, chevron-shaped grooves. The teeth are unknown as all the specimens consist of two valves fastened together.

The younger specimens of this species resemble *A. mirandana* (n. sp.), but are higher for their length.

Age: Miocene.

Locality: District of Buchivacoa, State of Falcón, locality numbers 1936, 2420.

Arca (Scapharca) cornellana H. K. Hodson, n. sp. Pl. 6, figs. 4, 5.

The shell is small, long and narrow, produced and somewhat keeled posteriorly. It is ornamented with about 31 narrow ribs separated by wider interspaces. Posteriorly, the ribs are wider, especially on the keel. On the right valve, the anterior ribs are usually bifurcate on adult shells. The beaks are medially sulcate, full, and situated at about the anterior fourth of the shell. The cardinal area is lanceolate, only moderately wide, and extends almost three-fourths of the length of the shell. The teeth are very short, rather widely spaced and longer on the ends of the series. They are arranged in a scarcely interrupted series, with about 22 anterior and 26 posterior. The inner margin is fluted in harmony with the external ribbing.

This species is easily distinguished from *A. mirandana* (n. sp.) by its posterior keel and more quadrangular shape.

Age: Miocene.

Locality: District of Bolívar, State of Zulia, locality numbers 3249, 3250.

Arca (Scapharca) actinophora Dall

Scapharca (Scapharca) actinophora Dall, 1898, Trans. Wagner Free Inst. Sci., vol. 3, pt. 4, p. 647, pl. 33, fig. 26.

Scapharca (Scapharca) actinophora Dall, Sheldon, 1916, Paleont. Amer., vol. 1, p. 50, pl. 11, fig. 13.

Arca actinophora Dall, Olsson, 1922, Bull. Amer. Pal., vol. 9, no. 39, p. 185, pl. 23, figs. 7, 8; pl. 25, fig. 3.

A. actinophora Dall is a rather rare species in Venezuela and not very well preserved. The few specimens found are like those figured by Dall and Olsson.

Age: Miocene.

Locality: District of Colina, State of Falcón, locality numbers 122A, 122B, 127.

***Arca (Scapharca) lienosa* Say**

Pl. 6, fig. 6.

Arca lienosa Say, 1832, Am. Conch., 4, pl. 36, fig. 1.

Arca lienosa Say, Tuomey and Holmes, 1855, Pleioc. Fos. S. Car., p. 40, pl. 15, figs. 2, 3.

Arca lienosa Say, Heilprin, 1887, Trans. Wagner Free Inst. Sci., vol. 1, p. 97, (*partim*).

Scapharca (Scapharca) lienosa Say, Dall, 1898, Trans. Wagner Free Inst. Sci., vol. 3, pt. 4, p. 636.

Arca lienosa Say, Sheldon, 1916, Paleont. Amer., vol. 1, no. 1, pp. 35-36, pl. 7, figs. 26, 27, 28; pl. 8, figs. 1, 2.

In Venezuela, there occurs a very abundant ark which is so close to *Arca lienosa* Say that it does not seem worthy of even varietal rank. In fact, some of the specimens are practically identical. Its ribs usually carry secondary grooves and the lower margin is usually arcuate. This same shell is still recent along the north coast of Venezuela although it is represented in the present collections by only two specimens. One of these is quite perfect; its lower margin is only slightly arcuate and the ribs carry only the main medial sulcus, but this seems to be mere variation. The recent and fossil specimens differ from *A. scticostata* Reeve in general shape and in the more closely set ribs.

Age: Miocene and Recent.

Locality: Districts of Colina and Democracia, State of Falcón, locality numbers 80, 131, 150B (?young), 155, 174, 182, 184, 185, 204 (?fragment), 206 (?young), 1033, 1252, 1255; recent from coast near La Vela, District of Colina, State of Falcón.

Arca (Scapharca) tamarana H. K. Hodson, n. sp. Pl. 5, figs. 10, 11.

The shell is small, inflated, posteriorly produced, ornamented with about 35 ribs. On the left valve, the ribs are rather strongly noded and about equal in width to the interspaces, except on the posterior keel where they are wider and smoother. On the left valve, the ribs are a little narrower and smoother. The beaks are situated a little anterior to one-fourth the length of the shell; they are medially sulcate and inflated, especially posteriorly. The cardinal area is lanceolate, marked with about 4 grooves, and is almost as narrow as in *Argina*. The teeth are short in the center and longer at the ends; they are arranged in an almost uninterrupted series with about 26 posterior and 19 anterior. The inner margin is scarcely grooved anteriorly, but is deeply fluted posteriorly.

This species is less inflated than *A. zuliana maracai-bensis* (n. subsp.), has wider ribs, and a narrower ligamental area.

Age: Miocene.

Locality: District of Buchivacca, State of Falcón; District of Bolívar, State of Zulia; locality numbers 1942, 3249, 3250, 4619.

Section ARGINA Gray

Arca (Scapharca) democraciana H. K. Hodson, n. sp.

Pl. 6, figs. 1, 2, 3.

The shell is rather small, plump, equivalve, keeled posteriorly and slightly produced. It is ornamented with about 32-34 low, wide ribs, which are separated by interspaces about half of the width of the ribs; the ribs on the right valve and on the anterior of the left valve are slightly farther apart; the ornamentation of the ribs is slight or worn off on all the available specimens. The beaks are low, close-set, medially sulcate, and situated at the anterior fourth of the shell. The hinge line is scarcely

interrupted and has about 31 posterior and 14 anterior teeth. The cardinal area is very narrow and carries 3 or 4 grooves. The posterior end of the hinge line is prominent and looks like an ear. The crenulations of the inner margin correspond to the external ribs and are deeper posteriorly.

This abundant *Arca* is usually poorly preserved.

Age: Miocene.

Locality: Districts of Democracia and Colina, State of Falcón, locality numbers 70A, 118, 150B, 185, 187, 1026, 1869, 1872, 1883, 1934.

Genus GLYCYMERIS Da Costa

Glycymeris canalis Brown and Pilsbry

Glycymeris canalis Brown and Pilsbry, 1911, Proc. Acad. Nat. Sci. Phila., p. 364, pl. 28, fig. 10.

Glycymeris canalis Brown and Pilsbry, Olsson (*partim*), 1922, Bull. Amer. Pal., vol. 9, no. 39, p. 177, pl. 18, figs. 2, 6, 7.

Glycymeris canalis Brown and Pilsbry, Maury, 1925, Bull. Amer. Pal., vol. 10, p. 183, pl. 29, figs. 3, 4.

We have several hundred specimens of this stock of *Glycymeris*. It is an exceedingly common and variable species; there are all variations, mutations and intergrading forms between the species, *sensu stricto*, and forms which have been described as *G. trilobocostata* Pilsbry and Brown and *G. lloydsmithi* Pilsbry and Brown. We see no reason for considering these latter forms other than subspecies. When the specimens show the "brace-shaped" or 3-parted character of the ribs prominently to the ventral margin, there is no reason why such forms may not be referred to the subspecies *trilobocostata*. Those specimens which, in the adult stages, tend to become smooth ventrally may be referred to the subspecies *lloydsmithi*. The peripheral outline of the valves in this group assumes very marked variations, varying from transversely elliptical to altitudinally ovate; gerontic speci-

mens tend to be produced posteriorly.

Age: Oligocene and Miocene.

Locality: Common in the State of Falcón; District of Miranda, State of Zulia; Cartagena, Colombia; locality numbers 6, 23, 70A, 72, 75, 78, 79, 80, 81, 82, 83, 86, 90, 93, 94, 118, 122B, 122C, 123, 127, 130, 131, 149A, 150A, 150B, 153A, 154, 155, 159, 178, 182, 183, 184, 185, 187, 189, 193, 204, 206, 206A, 216, 291, 298, 300, 1007, 1012, 1013, 1033, 1034, 1035, 1100, 1111, 1255, 1335, 1629, 1887, 2027.

***Glycymeris canalis lloydsmithi* Pilsbry and Brown**

Glycymeris lloydsmithi Pilsbry and Brown, 1917, Proc. Acad. Nat. Sci. Phila., vol. 59, p. 39, pl. 6, fig. 6.

Glycymeris lloydsmithi Pilsbry and Brown, Olsson, 1922, Bull. Amer. Pal., vol. 9, p. 353, pl. 28, figs. 8-10.

Variations which may be referred to this subspecies are found in several collections. Only those collections which contain rather abundant specimens of this subspecies are included in the list of localities.

Age: Miocene.

Locality: Districts of Colina, Miranda and Democracia, State of Falcón; Cartagena, Colombia; locality numbers 84, 131, 216, 225A, 1100, 1255.

***Glycymeris canalis trilobcostata* Pilsbry and Brown**

Glycymeris trilobcostata Pilsbry and Brown, 1917, Proc. Acad. Nat. Sci. of Philadelphia, p. 39, pl. 6, fig. 5.

Glycymeris canalis Brown and Pilsbry, Olsson (*partim*), 1922, Bull. Amer. Pal., vol. 9, pp. 349-350, pl. 21, fig. 4.

Glycymeris trilobcostata Pilsbry and Brown, Maury, 1925, Bull. Amer. Pal., vol. 10, p. 184, pl. 29, fig. 11.

General remarks which apply to this form have been given under the discussion of the species, *sensu stricto*.

Age: Oligocene-Miocene.

Locality: Districts of Colina and Miranda, State of Falcón; District of Bolívar, State of Zulia; Cartagena, Colombia; locality numbers 149A, 266, 1100, 1552, 3246, 3249, 3250.

Glycymeris canalis democraciana F. and H. Hodson, n. subsp.

Pl. 2, figs. 2, 5; pl. 3, fig. 2.

This subspecies differs from *G. canalis* Brown and Pilsbry mainly in being much larger and in being produced posteriorly. Our specimens average 40-45 mm. in altitude, and the greatest length is approximately equal to the altitude. There are 12 or more teeth on each half of the hinge line; the teeth nearer the center are more arcuate and larger. Young specimens cannot be told from the young of the species, *sensu stricto*.

It differs from the subspecies *lloydsmithi* Pilsbry and Brown in being more produced posteriorly and in having ribs distinct to the ventral margin.

Age: Miocene.

Locality: Districts of Democracia and Colina, State of Falcón, locality numbers 72, 81, 82, 93, 94, 148A (*cf.*).

Glycymeris tumefacta lavelensis F. Hodson, n. subsp.

Pl. 8, figs. 1, 4; pl. 9, fig. 1.

The shell is large, tumid, and slightly inequilateral. The submargins are only slightly curved. The beaks are strongly ribbed with about 13-15 main ribs which subdivide in low, wide, radially striate ribs. The pronounced character of the ribbing near the beaks soon disappears into indistinct, yet perceptible, ribs which carry to the ventral margin; the ribs are striate with 3-5 radial threads; the interspaces are usually less than half the width of the ribs and carry 1-2 radial threads; thus, the whole shell is covered with radial threads; the ribs are scarcely distinguishable near the submargins, but the radial striation is conspicuous over the entire surface of the shell. The inner basal margin is strongly toothed. The cardinal area is moderately wide. The line of teeth is slightly arcuate; the dentition is very feeble under the beaks and forms an area which comprises a little less than one-third the total length of the whole hinge line; the anterior teeth (about 6

in number) are strong and oblique and become progressively smaller and more peg-like posteriorly.

This form belongs to the *G. tumefacta* Pilsbry and Brown¹ stock. This subspecies has much stronger ribbing on the beaks, which, also, tend to be a little higher; it has minute radial striation which is said to be lacking on the type from Colombia. The Venezuelan form is much larger than *G. jamaicensis* Dall from Bowden, Jamaica.

Age: Miocene.

Locality: District of Colina, State of Falcón, locality numbers 122B, 123, 131, 149, 154, 155, 160, 210, 322 (?), 1042, 1043, 1255, 1330, 1552.

Family OSTREIDÆ Lamarck

Genus OSTREA Linné

Ostrea wiedenmayeri F. Hodson, n. sp.

Pl. 8, figs. 2, 3, 5, 6; pl. 9, fig. 5.

Shell thick, moderately large, attached valve finely corrugated. The upper valve is comparatively flat and shows concentric lines of growth. The attached valve is usually deep and very thick in adult specimens; when not weathered, the outer layer shows numerous, closely spaced, radial riblets or plicæ; the area of attachment is usually large. When viewing the interior of the lower valve, the ligamental groove is twisted obliquely to the left. The submargins are denticulate near the beak.

The young specimens resemble *O. democraciana* (n. sp.), but are usually distinguished by the more numerous plicæ on the attached valve.

Named in honor of Dr. C. Wiedenmayer who collected the material.

Age: Oligocene.

Locality: District of Buchivacoa, State of Falcón, locality numbers 2424, 2426, 2452.

¹ Proc. Acad. Nat. Sci. of Philadelphia, 1917, pp. 38-39, pl. 6, fig. 7.

Ostrea tacalensis F. Hodson, n. sp. Pl. 9, figs. 4, 6; pl. 10, figs. 2, 4, 6.

Shell is rather small with one valve plicate and the other smooth. The lower valve is ornamented with many plicæ, which are sometimes bifurcating and are usually wider than the interspaces; the valve is moderately deep and has a ligamental groove which turns very obliquely to the left; the margin is closely denticulate on the proximal half of the shell. The upper valve is smooth and not ornamented except by concentric lines of growth.

This species somewhat resembles the younger specimens of *O. wiedenmayeri* (n. sp.), but is a smaller shell and has coarser plicæ.

Age: Eocene-Oligocene.

Locality: District of Buchivacoa, State of Falcón, locality numbers 2438, 4609.

Ostrea democraciana F. Hodson, n. sp.

Pl. 9, figs. 3, 7; pl. 10, figs. 1, 3.

Shell small, attached valve plicate, upper valve smooth. The attached valve is deep; externally, it is ornamented with rather strong radial plicæ, which may be single or bifurcating; the plicæ frequently project beyond the margin of the shell as quasi spines. The ligamental groove is usually strongly recurved. The inside of the valves is denticulate on the submargins near the beak. The upper valve is usually moderately convex, and not ornamented exteriorly except by concentric lines of growth; the margin of this valve is not usually undulated as in the following subspecies.

The *Ostrea* and its varieties are very common and there are all intergradations between the species and its subspecies.

Age: Oligocene-Miocene.

Locality: Districts of Democracia, Federación, Acosta and Buchivacoa, State of Falcón; District of Urdaneta, State of Lara; locality numbers 6, 815, 995, 1231, 1627,

1703, 1705, 1705A, 1736, 1737, 1741, 1751, 1752, 1761, 1792, 1794, 1795, 1799, 1800, 1936 (?), 1939, 2022, 2023, 2027, 2049, 2096 (*cf.*).

Ostrea democraciana chiriguarana F. Hodson, n. subsp.

Pl. 10, fig. 5; pl. 11, figs. 1, 2, 3.

This subspecies is usually somewhat smaller than the species, *sensu stricto*. It is characterized by fewer, more pronounced plicæ, which cause the margins of both valves to be very undulating. The attached valve is frequently depressed between the half dozen or less strong corrugations or major plicæ, which are commonly found in most specimens. The internal denticulations near the beak are usually fewer on the anterior margin than on the posterior. The upper valve is moderately convex and usually somewhat plicate, but may or may not be plicate. This subspecies resembles *O. subfalcata* Conrad except that our form is smaller and carries denticulations on the margins near the beak.

Age: Miocene-Pliocene.

Locality: Districts of Buchivacoa, Colina, Zamora and Democracia, State of Falcón, locality numbers 80, 81, 83, 91, 171, 185, 300, 306, 1028 (?), 1065, 1353, 2410, 2416.

Ostrea democraciana cujiensis F. Hodson, n. subsp.

Pl. 12, figs. 1, 2, 3.

This subspecies is very thin, as both valves are comparatively flat. The attached valve is very shallow and is ornamented with radial plicæ which are not very pronounced. The upper valve is flat or slightly convex and is not radially ornamented; it shows concentric lines of growth.

The length of the valves tends to be greater in proportion to the height than in the species, *sensu stricto*, or in the other subspecies; also the body cavity is smaller because the valves are relatively flatter.

Age. Miocene.

Locality: Districts of Buchivacoa, Democracia, Falcón, Colina and Miranda, State of Falcón, locality numbers 79, 80, 86, 95, 97, 154, 169A, 179, 184, 185, 187, 303, 307, 830 (?), 1033, 1232, 1334 (*cf.*), 1855, 1856, 1863, 1864, 1865, 1866, 1872, 1911, 1927, 2207.

Ostrea gatunensis aguacalarensis F. Hodson, n. subsp.

Pl. 10, fig. 7; pl. 11, fig. 4; pl. 12, fig. 4.

This subspecies is distinguished from *O. gatunensis* Brown and Pilsbry¹ by its larger size and by its ligamental groove usually being oblique in the opposite direction to that shown in the illustration of the type of the species. The attached valve is deep, and, viewing the interior, the short ligamental groove usually twists to the right; the exterior is ornamented with rather large, somewhat sharp corrugations in the younger stages; these corrugations or plicæ become more rounded in adult specimens and tend to bifurcate in some cases; there are usually 4 or 5 strong plicæ on each valve with some weaker ones on the attached valve. The upper valve is flat or slightly concave; in the younger specimens, it is sometimes somewhat convex. The margins of both valves usually show broad undulations. The upper valve carries less pronounced corrugations and is usually broadly undulated instead of having strong plicæ like those in the species, *sensu stricto*. Moreover, the beaks of the adult attached valve are usually somewhat excavated. Our subspecies lacks the rugose area on the margins near the beaks.

Age: Oligocene-Miocene.

Locality: Districts of Democracia, Miranda and Acosta, State of Falcón, locality numbers 729, 929, 1292, 1735, 1741, 1753, 1914.

Ostrea virginica Gmelin

Ostrea virginica Gmelin, 1792, Syst. Nat. p. 3336.

Ostrea virginica Gmelin, Dall, 1898, Trans. Wagner Inst. Sci., vol. 3,

¹ Proc. Acad. Nat. Sci. of Philadelphia, 1911, p. 366, pl. 29, figs. 1, 2.

p. 687.

Ostrea virginica Gmelin, Maury, 1917, Bull. Amer. Pal., vol. 5, p. 348.

Ostrea virginica, Gmelin, Maury, 1925, Bull. Amer. Pal., vol. 10, pp. 232-233.

This species is not particularly common in Venezuela as a fossil.

Age: Pliocene-Recent.

Locality: Districts of Acosta, Colina and Democracia, State of Falcón, locality numbers 69, 1435, 1506, 1567.

Ostrea virginica falconensis F. Hodson, n. subsp.

Pl. 9, fig. 2; pl. 13, figs. 2, 4, 5.

Weathered specimens of this subspecies are common and grade into the ventricose varieties of *O. virginica* Gmelin. The short, attached valve is comparatively deep and is sometimes ornamented with coarse radial rugæ. The shell is typically thick and blunt at the attached end of the lower valve. The upper valve is flat and is not ornamented except by the successive lines of growth. Weathered specimens of the lower valve commonly appear to be about smooth.

Age: Miocene-Pliocene.

Locality: Districts of Buchivacoa, Democracia, Miranda, Colina and Acosta, State of Falcón, locality numbers 71, 74, 78, 80, 81, 87, 89, 90, 92, 112 (*cf.*), 196, 201, 203B, 242 (?), 415, 1003, 1019 (and variation), 1023, 1030, 1064, 1224, 1226, 1228, 1233, 1241, 1244, 1325 (?), 1437, 1500, 1567, 1860, 1861, 1862, 1874, 1880, 1882, 1887, 1888, 1889.

Family PECTENIDÆ Lamarck

Genus PECTEN Müller

There are so many intermediate forms between the subgenera of *Pecten* that we have preferred to retain the generic name, *Pecten*, instead of raising the subgenera to generic rank.

Pecten soror urumacensis Harris, n. subsp.

Pl. 13, fig. 1; pl. 14, figs. 3, 4.

Shell averaging from 45 to 60 mm. in height and width; valves very unequal, the left being concave and the right

very convex; ribs about 20 on the concave valve, both these and the broad interspaces are covered with concentric squamose growth lines when not eroded; larger valve with about 22 ribs, rather wider than the interspaces; interspaces with indications of squamose growth-lines, seemingly farther apart than are those on the concave valve; ribs showing but few traces of growth lines; ears with fewer radii than seen in the following subspecies.

The greater size of this shell serves to distinguish it from typical *soror*.

Age: Miocene.

Locality: Districts of Democracia, Miranda and Colina, State of Falcón, locality numbers 70C, 73, 78, 79, 80, 81, 82 (and variation), 83, 83B, 84, 88A, 94, 97, 98, 100, 109, 110, 115, 120, 125, 137, 138C, 140, 146, 150A, 160, 165, 168, 185, 186, 188, 205, 207, 219A, 220, 224, 281, 292, 1064, 1254, 1866, 1869, 1870, 1871.

Pecten soror codarcicola Harris, n. subsp.

Pl. 13, fig. 3; pl. 14, figs. 1, 5; pl. 15, fig. 7.

Shell of moderate size, concave-convex; with about 19 well-defined costæ on each valve with 2 or 3 less-developed marginal ones; right valve concave centrally, but with uplifted margins fore and aft dorsally; wing with three strong and one or two additional radii; ear with less-pronounced markings; both ear and wing nearly right-angled at the hinge terminations; fine slightly imbricated lines pass concentrically over the whole exterior surface; interiorly the muscular scar is definitely marked above, indefinitely below, pit well marked, on either side of which, just below the dorsal hinge margin, there are radiating, tooth-like laminæ; right valve, when well developed and well preserved, shows an anterior ear somewhat bent out over the shell margin, ornamented with 6 radii much wider than their interspaces; below the ear, the shell margin is somewhat abruptly bent inward and carries fine radiating striæ, below which the regular ribbing commences, with small

ribs at first, increasing to the fifth which is of normal size; posterior wing and margin very similarly ornamented, though the number of small-sized ribs is but two or three; whole surface finely engraved with slightly imbricated concentric lines, but these are often worn off on the summits of the ribs; each rib characterized, basally at least, by a median depression, hence giving a somewhat bifid appearance; at the very basal margin, somewhat unusually well-preserved specimens show that there is a tendency to form another channel on the rib and hence produce a fine, raised, secondary rib upon the primary.

The exact relationship of this form to *soror* cannot be stated without access to better material from Santo Domingo than we have at present, or without much more detailed descriptions of the species. The size of this subspecies with dimensions extending to about 70 mm., whereas *soror* has no recorded dimension of over 47 mm.; the clearly defined grooving of the ribs in the right valve, and the more clearly defined radii on ear and wing tend to make this a fairly distinct variety. This species is analogous to the West coast *P. stearnsii* Dall.

Age: Miocene and Pliocene.

Locality: Districts of Democracia and Colina, State of Tlaxcá, locality numbers 69, 123.

***Pecten gatunensis* Toulou**

Pecten (Flabellipecten) gatunensis Toulou, 1909, Jahrbuch der k.-k. Geol. Reichsanstalt, Wien, vol. 58, (1908), pp. 711-712, pl. 26, fig. 2.

Pecten gatunensis Toulou, Brown and Pilsbry, 1911, Proc. Acad. Nat. Sci. of Philadelphia, vol. 63, p. 365.

Pecten gatunensis Toulou, Olsson, 1922, Bull. Amer. Pal., vol. 9, no. 39, p. 197, pl. 16, figs. 3, 4.

This is a very common species in our Miocene. The number of ribs is variable. Our specimens from Gatun and Venezuela usually show about 20 well developed ribs on the convex valve, in addition to the less prominent ribs which may be present on or near the submargins.

Age: Miocene.

Locality: Districts of Miranda, Colina, Buchivacoa and Democracia, State of Falcón; Gatun, C. Z.; locality numbers 84, 122A, 122B, 125 (?), 129, 131, 132, 133, 134, 136, 137, 138, 138B, 138C, 139, 140, 142, 144, 146, 148BB, 149A, 150B, 155, 156, 157, 158, 159, 160, 161, 162, 166, 168, 171, 174, 180, 185, 212, 219A, 235, 246, 259, 260A, 261, 266, 267, 270, 277, 282 (?), 283, 285, 188, 295, 308B, 313, 314, 318, 323, 327, 330, 332, 333, 334, 354, 359, 409, 421 (*cf.*), 1009, 1014, 1270, 1334, 1335, 1339, 1342, 1627 (*cf.*), 1823, 1823A, 1825, 1839, 1856, 1858, 1859, 1866, 1893 (*cf.*), 1898, 1908, 1931C.

***Pecten MacDonaldi* Olsson,**

Pecten MacDonaldi Olsson, 1922, Bull. Amer. Pal., vol. 9, p. 370, pl. 19, figs. 1, 2.

This species is sparsely represented in our collections, having been found in only a few localities.

Ages Miocene.

Locality: District of Colina, State of Falcón, locality numbers 1009 (*cf.*), 1332, 1508 (*cf.*).

***Pecten circularis venezuelanus* F. and H. Hodson, n. subsp.**

Pl. 14, fig. 6; pl. 15, figs. 2, 4, 5; pl. 17, fig. 1.

This subspecies, which is very common in the Miocene of Venezuela, stands exceedingly close to the recent *Pecten circularis* Sowerby¹ from the Pacific coast. While there are some variations which cannot be told from variations of the recent species, it is not difficult to separate most of the Venezuelan forms from the recent *P. circularis* by slight but rather constant differences. Our subspecies is slightly smaller, and the umbones are more pinches due to a narrowing and inflating of the umbones between the tips of the beaks and the submargins. The anterior ear usually shows stronger striæ than are present on the recent *P. circularis*; there are 4 or 5 strong striæ on the anterior ear

¹ Proc. Zool. Soc. London, 1835, p. 110.

of the right valve. In our large collections from many localities, we find many variations and all intergradations between the species, *sensu stricto*, and our subspecies *venezuelanus*, as well as between this subspecies and the subspecies *cornellanus*. The specimens average about 40 mm. in altitude.

Age: Miocene and Pliocene.

Locality: Common in the State of Falcón, locality numbers 68, 68A, 69, 70A, 71, 73, 74A, 75 (and variation), 78, 79 (and variation), 80, 81, 82, 83, 83A, 83B, 84, 85 (and variation), 88 (variation), 90, 91, 95, 96, 97, 98, 110, 111, 115, 118, 119, 120, 125, 150, 150A, 150B (and variations), 151, 154, 169A, 178, 184, 185, 186, 187, 1188, 196, 197, 198, 202, 205, 205A, 206, 206A, 207, 208, 209, 215, 216, 219, 220, 220A, 222, 225, 225A, 242 (variation, 243 (*cf.*), 290, 291, 296, 297, 298, 299 (variation), 300 (variation), 304, 307, 675, 697, 1000, 1004, 1006, 1011, 1026, 2027, 1030 (and variations), 1031, 1033, 1046 (variation), 1064, 1071 (variation), 1072, 1111, 1232, 1248 (and variation), 1255, 1332, 1353, 1354, 1430, 1450, 1500, 1867 (?), 1868, 1869, 1931C 2054 (and variation), 2208.

Pecten circularis cornellanus F. and H. Hodson, n. subsp.

Pl. 14, fig. 2; pl. 15, figs. 3, 10; pl. 16, fig. 3.

This is a subspecies in which the ribs in the adult stage have steep, almost vertical, sides instead of the more sloping sides of the species, *sensu stricto*, and of the other subspecies, *venezuelanus*; the sides are even somewhat excavated in many cases, and the tops of the square ribs project slightly over them. The interspaces appear almost square; as in the related forms, the concentric growth lines swing down in the interspaces and swing up on top of the ribs. Like the other subspecies, this is an exceedingly abundant and variable form. The square shape of the ribs may be maintained entirely to the margin or it may give way to ribs with slightly sloping sides. Generally, this subspecies is somewhat smaller than *P. circularis venezuelanus*, av-

eraging about 30–35 mm. in altitude, although some specimens exceed 40 mm.

This subspecies may be equivalent in part to *P. levicos-tatus* Toula,¹ but his figures are so poor that it is impos-

¹ Jahrbuch der k.-k. Geol. Reichsanstalt, Wien, 1909, vol. 58, (1908), p. 713, pl. 26, figs. 4–6.

sible to be sure. His type (fig. 4) has rounded ribs and is not to be confused with the square ribs so common in this Venezuelan subspecies. Toula's species may be only a variation or variety of *P. circularis*.

Age: Miocene.

Locality: Common in the State of Falcón; Gatun, C. Z.; locality numbers 68A, 69, 70A, 70C, 78, 79, 80 (?), 81, 82, 83, 83A, 83B, 88A, 93, 94 (and variations), 95, 97, 109, 120, 121, 125, 127, 157, 182, 184, 185, 186, 193 (variation), 193A, 215, 216, 217, 219 (variation), 222, 224, 242, 307, 1007, 1010, 1027, 1029, 1030, 1031, 1033, 1066, 1078, 1111, 1115, 1232, 1255, 1256, 1332, 1447 (and variations), 1855, 1871. 1872, 1911.

Pecten circularis caucanus F. and H. Hodson, n. subsp.

Pl. 15, figs. 1, 8.

This subspecies is distinguished only in adult forms and is characterized by the radial striation of the ribs. The ribs typically have sloping sides as in the species, *sensu stricto*, but many specimens have been noted which have rather square ribs which are becoming distinctly striate. The number of striae on a rib is very variable, but usually there is a strong stria, which may be almost a supplementary riblet, at the base of each rib, with 1–4 smaller striae between the crest of the rib and the strong, basal, radial thread. Between the strong radial threads at the base of adjacent ribs, there is a deeply incised, channeled, radial sulcus.

The striation is never present on the younger shells, which cannot be told from young shells of either of our other two subspecies.

Age: Pliocene.

Locality: District of Democracia, State of Falcón, locality number 69.

Pecten (aff. **Plagiectenium**) **gilbertharrisi** F. and H. Hodson, n. sp.
Pl. 19, figs. 1, 2, 3; pl. 20, fig. 6.

Shell is about as wide as high, equivalve, and almost equilateral except for the ears. The valves are moderately convex, and ornamented with about 17 high, flat-topped ribs, the sides of which are almost vertical. The interspaces are about as wide as the ribs or a little wider. The flat-topped ribs are crossed transversely by elevated, incremental lamellæ. The anterior ear is radially striate, the posterior is smoother and crossed by curved growth lines.

This is an extremely common species but the specimens are almost never well preserved.

Named in honor of Prof. G. D. Harris, who has done splendid work in advancing our knowledge of Venezuelan paleontology.

Age: Miocene.

Locality: Districts of Democracia, Miranda, Colina and Buchivacoa, State of Falcón, locality numbers 100 (variation), 103, 221, 280 (*cf.*), 317 (?), 418, 1231 (with variations), 1823, 1823A, 1824, 1840, 1848, 1854, 1855, 1856, 1858 (and variations), 1859, 1860, 1862, 1863 (variation), 1864, 1867, 1892, 1893, 1905, 1906, 1908, 1910 (and variations), 1912, 2024.

Pecten gilbertharrisi democracianus F. and H. Hodson, n. subsp.
Pl. 20, fig. 5.

This subspecies differs in having rounded, v-shaped ribs, and in having the growth lines swing down on top of the ribs instead of crossing them straight and at right angles to the length of the ribs.

Age: Miocene.

Locality: Districts of Democracia and Miranda, State of Falcón, locality numbers 79 (variation), 95 (variation),

150A, 168 (variation), 169A (variation), 229, 236, 1848, 1866, 1869.

Pecten interlineatus aidei (Williston MS.) Harris, n. subsp.

Pl. 15, figs. 6, 9.

Williston's types, herewith figured, agree fairly well with Pilsbry's diagnosis and figure,¹ except they are practically twice the dimensions of his San Domingan type. The ears seem marked a little differently in the two forms.

Closely related to these forms, is *P. crocus* Cooke,² from the "Oligocene" near Crocus Bay Anguilla.

Age: Miocene.

Locality: Districts of Democracia and Miranda, State of Falcón, locality numbers 84, 87, 1064, 1067 (*cf.*), 1866

Pecten (Chlamys) buchivacoanus F. and H. Hodson, n. sp.

Pl. 16, figs. 6, 8, 10, 11.

Shell is of medium size, equivalve, varies from 20 to 50 mm. in altitude, and is usually about as wide as long. Young specimens are usually a little higher than long. Both valves are similar, moderately inflated, and carry 17-18 radially striate, rounded ribs, which are about as wide as the striate interspaces. The ribs carry 3 strong, radial striæ, the most prominent of which is down the middle of the rib; the other two primary striæ are on each side about half way between the crest of the rib and the middle of the interspaces; on top of the rib on either side of the middle radial thread, there sometimes appears an intervening secondary. In the middle of the interspaces, there is a radial thread which is stronger than the one on either side of it at the base of the ribs; in younger specimens, only the middle thread in the interspaces is present. The growth lines form scaly imbrications when they cross the radial striæ; the scales are easily worn away and are lacking in even slightly weathered specimens.

¹ Proc. Acad. Nat. Sci. Phila., 1921, p. 411, pl. 45, figs. 3.

² Carn. Inst. Wash., 1919, Publ. No. 291, p. 135, pl. 9, fig. 2a.

The hinge line is about two-thirds the width of the valves. The ears are approximately equal in length, radially striate, with 9–10 striæ of varying strength.

This species bears some resemblance to *P. sansebastianus* Maury.¹ Our species has more radial striæ in the interspaces and the shell is slightly wider.

Age: Oligocene.

Locality: Districts of Buchivacoa, Miranda and Petit, State of Falcón, locality numbers 36 (variation), 38 (or variation), 45, 46, 49 (variation), 58, 60 (or variation), 254, 155, 404, 1084, 1221, 1262, 1649, 1763, 1963, 1967, 2002, 2004.

Pecten buchivacoanus maracaibensis F. and H. Hodson, n. subsp.

Pl. 17, fig. 6.

This subspecies differs in being more inflated and usually much larger, averaging 50–75 mm. in altitude. The striæ seem to appear at a slightly younger stage. The interspaces are somewhat narrower and the ribs are a little more prominent and less rounded on top. The subspecies *falconensis* differs in having slightly narrower, more v-shaped interspaces and in having striæ of about equal strength both on the ribs and in the interspaces. In the subspecies *falconensis*, there is a sulcus down the middle of the interspaces, which corresponds to a primary radial thread in the species, *sensu stricto*, and in the subspecies *maracaibensis*. There are all intergradations between this subspecies and the species, *sensu stricto*, as well as between the two subspecies.

Age: Miocene.

Locality: Districts of Democracia, Miranda, Colina and Acosta, State of Falcón, locality numbers 100, 136, 137, 138C, 139, 140 (variation), 143, 241, 269B, 270, 283, 288, 310, 314, 322, 331, 332, 359, 413, 418, 421, 717, 904, 1111, 1818, 1825A, 1833.

¹ New York Academy of Sciences, 1920, vol. 3, pt. 1, p. 19, pl. 3, fig. 1.

Pecten buchivacoanus falconensis F. and H. Hodson, n. subsp.

Pl. 17, figs. 2, 3, 4, 5, 7.

This subspecies differs in having the ribs more sloping and in having the interspaces more v-shaped than in both the species, *sensu stricto*, and the subspecies *maracaibensis*; in the latter two, the interspaces are rather flat and terminated by the rather steep flanks of the ribs. This subspecies further differs in the character of the radial striæ, which are almost uniform in strength and regularly spaced over the ribs. In the adult stage, there are about 7 of these striæ regularly spaces on the sides and top of each rib; in the interspaces, there are 2 or sometimes 3 striæ, and, in the middle of the interspace, there is usually a sulcus instead of a radial thread. This subspecies is more inflated than the species, and sometimes is even more inflated than the subspecies *maracaibensis*, but the latter subspecies is usually larger.

Age: Miocene.

Locality: Common in the State of Falcón, locality numbers 68, 73, 78, 79, 80, 81, 83, 84, 88, 97, 98, 100, 109, 110, 115, 119, 120, 122B, 122C, 123, 125, 131, 132, 133, 137, 138, 138C, 142, 146, 149A, 149B, 150, 150A, 154, 155, 156, 159, 168, 174, 176, 178, 181, 183, 185, 205, 205A, 206, 207, 209, 215 (?), 220, 224, 227, 229, 232, 233, 236, 237, 241, 259, 261, 264, 266, 269A, 270, 277, 283, 289 (?), 297, 300, 303, 305, 306 (?), 311 (or variation), 330, 331, 338, 421, 753, 1006, 1011, 1013, 1017, 1033, 1035, 1111, 1116, 1231, 1255, 1266, 1270, 1334, 1337, 1430, 1507, 1552, 1704, 1817, 1825, 1827, 1854, 1855, 1856, 1858, 1859, 1860, 1861, 1863, 1866, 1868, 1871, 1892, 1897, 1927, 1931C.

Pecten (*Æquipecten*) effossus Brown and Pilsbry

Pecten (*Æquipecten*) *effossus* Brown and Pilsbry, 1911, Proc. Acad. Nat. Sci. of Philadelphia, p. 364, pl. 28, figs. 4, 6.

This species is not common in our Venezuelan collections, having been found in only two localities.

Age: Miocene.

Locality: Districts of Miranda and Democracia, State of Falcón, locality numbers 341, 1808.

Pecten (aff. *Æquipecten*) **quirosensis** Harris, n. sp.

Pl. 16, figs. 1, 2, 4, 5, 7, 9.

Shell small, tumid, inequivalve, equilateral; surface marked by 16 well-defined ribs, or 18, if the edges of the submargins are included; ribs of the left valve simple in earlier stages of growth, broader than the interspaces, becoming higher or subcarinate toward the ventral margin by the increase in height and size of the median portion of the rib; carinae with a few distant nodules near the ventral margin; interspaces with sharply defined, distant, raised, concentric lines; right valve of about twice the depth of the left, similarly, but much less distinctly sculptured; ctenolium with about 6 teeth; anterior ear of right valve with 5 strong rays; ears of left valve and posterior ear of right valve ornamented with 4–6 fine, scaly radials, which become successively smaller toward the submargins; submargins sharply defined, narrow, and usually smooth; interior showing short, low-down, auricular crura, ligamental crura, and ribbing, strong marginally, dying out gradually before reaching the middle of the shell.

This shell would appear to be closely allied to *P. perlatus* of Crocus Bay, Anguilla, referred by Cooke to the "Oligocene." His diagnosis and figure seem to be of the right valve only. His expression "submargins with close radial riblets which form an uninterrupted series with those of the ears" ¹ would seem to differentiate his from our species. In size and general appearance, the forms are very similar.

Age: Oligocene-Miocene.

Locality: District of Miranda, State of Zulia, locality number 6.

¹ Carn. Inst. Wash. Publ. No. 291, p. 131, pl. 13, fig. 3.

Pecten (aff. **Nodipecten**) **colinensis** F. and H. Hodson, n. sp.
Pl. 18, figs. 3, 6; pl. 19, fig. 4.

Shell averages 90–100 mm. in altitude, and is nearly equivalve, suborbicular and moderately convex. The right valve is ornamented with about 11 rather flat-topped, prominent, radially striate ribs, in addition to less well developed ribs and radial striæ on the submargins; the tops of the ribs carry 3 or 4 about equally spaced, coarse, radial striæ; the sides of the main ribs are steep; the interspaces are about as wide or slightly wider than the ribs and carry 1–3 strong, radial threads; the radial ornamentation is crossed by the concentric lines of growth which swing up over the top of the ribs; at the points of intersection of the two sets of ornamentation, small beads or prominences are formed on the radial striæ, but no large nodes or large imbricating scales are to be found on this valve, which easily distinguishes it from the left valve. The hinge line is straight and about one-half as long as the disc of the shell. The anterior ears are slightly longer than the posterior; both are radially striate with 5–6 or more, strong, radial threads which are slightly noded by the imbricate growth lines. The left valve is ornamented with about 12 main ribs in addition to the incipient ribs and striæ on and near the submargins. The tops of the ribs are slightly rounded and carry 3–5 slightly scaly, radial striæ; the interspaces are about as wide, or slightly narrower than, the ribs, and carry 1–3 strong radial threads of the same general character as those on the ribs; at periodic intervals, usually about 10–15 mm. apart, there occur concentric rows of prominences, which are noticeable on all the ribs and interspaces of the left valve; the characteristic feature of this species is that every third rib on this valve bears larger nodes or very prominent scales at points of intersections with the rows of concentric prominences.

The left valve of *P. nodosus* Linné usually has 9–10

ribs with every rib noded; the left valve of *P. pittieri* Dall¹ has about 10 ribs with every other rib noded more strongly; the left valve of the present species has 11–12 ribs with every third rib noded more strongly.

Age: Miocene-Pliocene.

Locality: District of Colina, State of Falcón, locality numbers 115, 125, 150, 151, 188, 205A, 207, 208, 209 (?), 292, 421 (?), 1011, 1252, 1353.

Pecten coderensis (Williston MS.) Harris, n. sp.

Pl. 18, figs. 2, 4, 5.

There are about 16 or 17 ribs on either valve that have a tendency, especially in the left valve, to be shaped like an inverted v; in the right, nearly flat valve, this angularity is generally somewhat modified, and occasionally in the left, the ribs are rounded; in old right valves, the ribs may be very much rounded over and tend to become obsolete. Concentric marking is seen on young and well preserved specimens to consist of beautifully even, fine, engraved lines. Towards the base there may be a rougher, coarser lining. The submarginal areas are smooth and narrow and drop off abruptly to the auricular areas. The anterior ear of the right valve is perhaps the most noticeable feature of the shell. It is very well developed as the figures show and carries 6 or 7 radii increasing in strength and scabrous ornamentation towards the hinge margin. The posterior ear is very large and triangular and is marked only by very fine lines of growth; ctenolium, in the best preserved specimen we have, with 5 or 6 teeth. The angular character of the ribs of the left valve makes them appear farther apart than in the opposite valve; the concentric lining is apt to be better preserved; the ears are more nearly equal in shape and size and carry 8 or 10 radii which with their interspaces are beautifully marked with

¹ Smithsonian Miscellaneous Collections, 1912, vol. 59, number 2, publication 2077, p. 10; and Proc. U. S. Nat. Museum, vol. 66, 1925, art. 17, pl. 17, fig. 6.

fine growth lines.

In the matter of marking and in some general characters, this species resembles *P. thompsoni* Maury of Santo Domingo, and in auricular matters, *P. vaun* Cooke from Anguilla. *P. maturensis* Maury from East Trinidad in very late Tertiary or early Quarternary times is of this general type, though in that, it is the left valve that tends to lose its ribbing and become flat. This *Pecten*, however, is considerably larger than the above-mentioned forms.

Age: Miocene-Pliocene.

Locality: Districts of Democracia, Colina and Zamora, State of Falcón, locality numbers 69, 1022 (and variation), 1355, 1358, 1497.

Pecten coderensis willistoni Harris, F. and H. Hodson, n. subsp.
Pl. 20, fig. 2.

This subspecies is easily distinguished from *P. coderensis* (Williston MS) by its smaller size, more convex valves, and sharper, more elevate ribs. However, there are all intergradations between these two forms, and the subspecies merely marks the limit of variation toward being smaller and more sharply ribbed.

Age: Miocene.

Locality: Districts of Democracia, Miranda, Colina, Zamora and Falcón, State of Falcón, locality numbers 69, 70A (variation), 70B (intermediate forms), 70C, 71 (variation), 98, 200, 298, 307, 1022, 1024 (cf.), 1027 (fragments, 1243 (variation), 1248, 1355, 1358, 1497, 1874 (variation), 1886 (?), 2205 (variation).

Pecten antiguensis churuguarensis F. and H. Hodson, n. subsp.

Pl. 20, figs. 1, 3, 4; pl. 22, fig. 2.

Shell is orbicular, inequivalve, translucent so that the internal liræ are frequently visible from the exterior. The altitude averages 50–70 mm. There are 13–14 undulating ribs which extend to the margin of each valve. The flat left valve in the younger stages has squarer ribs than the

more convex valve; the flat valve tends to be a little concave in some specimens, although it is generally slightly convex. Both valves are ornamented with concentric growth lines which swing up over the rather low, undulating ribs, and down in the narrower interspaces. On each side of the interspaces, at the base of the ribs, are internal liræ, which usually are visible on the outside as radial dark lines separating the ribs and interspaces. The ears on the inflated right valve are pointed and produced above the hinge line as triangular projections on each side of the umbo. The liræ are about equally spaced in the younger stages, but on the margins of the adult shells the interspaces are a little wider than the intervals between the pairs of liræ. There is no contraction of the adjacent liræ toward the margin as mentioned in the description of *P. antiguensis* Brown.¹

This species is similar in some respects to *P. antiguensis* Brown, but does not show the tendency to become smooth towards the margin of one valve, nor do the adjacent pairs of liræ tend to contract toward the margin. The pointed ears, also, are very characteristic of our species, which is very common in its occurrence.

Age: Oligocene.

Locality: Districts of Petit, Miranda, Federación and Buchivacoa, State of Falcón, locality numbers 16, 30, 32, 33, 36, 40, 41, 47, 58, 59, 254, 429 (?), 489, 496, 500, 973, 1036, 1038, 1050, 1051, 1054, 1057, 1058, 1130, 1141, 1217, 1637, 1662, 1954, 1963, 1965, 1966 (?), 1987, 2002C, 2004, 2005, 2008.

Pecten (Amusium) aguacolarensis F. and H. Hodson, n. sp.

Pl. 18, fig. 1; pl. 21, figs. 1, 2.

Shell averages 85–100 mm. in altitude, and is about as long as high. Both valves are moderately convex with in-

¹ Proc. Acad. Nat. Sci. of Philadelphia, 1913, p. 613, pl. 18, figs. 1–3, 5.

conspicuous, concentric lines of growth. In well preserved fragments, the internal liræ are visible on the outside of the shell as dark, radial lines. The specimens are frequently very much thickened with gypsum; in some cases, the replaced shell is 10–15 mm. thick, instead of less than 1 mm., which is its normal thickness. The right valve is strengthened with about 10 pairs of internal liræ; the distance between each pair is 2–4 times as great as the interval between the constituent liræ. The left valve has 10–12 pairs of internal liræ; the distance between the pairs is about equal to or slightly greater than the distance between the liræ which constitute a pair. In both valves. the submargins are fairly wide. Specimens of either valve may occasionally show supplementary liræ adjacent to, and parallel to, the main pairs of liræ.

This character of having equally spaced liræ in one valve and paired liræ in the other valve is found in *P. pleuronectes* Linné, which is slightly larger and does not have such prominent liræ in the younger stages.

Age: Oligocene-Miocene.

Locality: Districts of Federación, Buchivacoa, Democracia and Miranda, State of Falcón; District of Urdaneta, State of Lara; locality numbers 15, 16, 806, 810, 995, 1058, 1129, 1264, 1287, 1290, 1291, 1294, 1733, 1735, 1736, 1737, 1740, 1939, 1979, 2035.

***Pecten (Amusium) luna* Brown and Pilsbry**

Pecten (Amusium) luna Brown and Pilsbry, 1912, Proc. Acad. Nat. Sci. of Philadelphia, vol. 64, p. 514, pl. 23, fig. 1 (*lapsus calami* for pl. 24, fig. 1).

Pecten (Amusium) luna Brown and Pilsbry, Olsson, 1922, Bull. Amer. Pal., vol. 9, pp. 377–378, pl. 20, fig. 1.

This species is rather uncommon in our Miocene beds. The valves are about equal, except in convexity; one valve tends to be only flatly convex.

Age: Miocene.

Locality: Districts of Democracia, Colina and Miranda, State of Falcón; Cartagena, Colombia; Gatun, C. Z.;

locality numbers 68, 70A (?), 81, 83B, 84, 85, 108, 115, 120, 122B, 122C, 125, 138B, 146, 150, 152, 156, 160, 176 (*cf.*), 181, 188, 193, 205, 205A, 206, 207, 208, 209, 216, 219A, 222, 229, 232, 233, 234, 241, 291, 293, 301, 304, 1009, 1251, 1253, 1322, 1823, 1867.

***Pecten (Amusium) mortoni* Ravenel**

Pecten Mortoni Ravenel, 1844, Proc. Acad. Nat. Sci. of Philadelphia, p. 96.

Pecten Mortoni Ravenel, Tuomey and Holmes, 1855, Pleiocene Fos. S. Car., p. 27, pl. 10, figs. 1, 2.

Pecten (Amusium) Mortoni Ravenel, Dall, 1898, Trans. Wagner Free Inst. Sci. of Philadelphia, p. 757.

Some large specimens of this species are found in the Pliocene of Venezuela. The Miocene species are slightly smaller.

Age: Miocene and Pliocene.

Locality: Districts of Democracia, Colina and Zamora, State of Falcón; Gatun Spillway, Gatun, C. Z.; locality numbers 69, 1022, 1030, 1357.

***Pecten (Amusium) zamorensis* F. and H. Hodson, n. sp.**

Pl. 22, figs. 1, 3, 4, 5, 6.

Shell averages 40–50 mm. in altitude, is moderately convex and slightly oblique. The hinge line is a little less than a third of the length of the disc. The ears are smooth except for growth lines and demarked from the umbones by a low, steep ledge. The umbones carry about 18 low, narrow ribs, which extend some 10–15 mm. from the tip of the beaks before they disappear. The shell shows faint, concentric lines of growth. Internally, the distal half of the valve carries about 14 pairs of internal liræ, which extend about half-way from the margin toward the beak before they disappear; the young stages show no internal liræ; in the adult stage, the main interspaces between the pairs of liræ are about equal to or slightly greater than the distances between the constituent liræ which form a pair. The left valve is fragmentary or young in our collections, but seems to be similar to, but slightly flatter than, the right valve.

Age: Pliocene.

Locality: District of Zamora, State of Falcón, locality number 1353.

Family SPONDYLIDÆ Fleming

Genus PLICATULA Lamarck

Plicatula densata Conrad

Pl. 23, figs. 1, 6.

Plicatula densata Conrad, 1843, Proc. Acad. Nat. Sci. of Philadelphia, vol. 1, p. 311.

Plicatula densata Conrad, 1845, Foss. of the Medial Tertiary, p. 75, pl. 43, fig. 6.

Plicatula densata Conrad, Whitfield, 1894, Monograph 24, U. S. Geol. Survey, p. 35, pl. 5, figs. 3-8.

Plicatula densata Conrad Dall, 1898, Trans. Wagner Free. Inst. Sci. of Philadelphia, vol. 3, pt. 4, p. 763 (*partim*).

Plicatula densata Conrad, Dall, 1915, U. S. Nat. Mus., Bull. 90, p. 125 (*partim*).

Not *Plicatula densata* Conrad, Cooke, 1919, Carnegie Inst. Washington, publ. no. 291, p. 145, pl. 11, fig. 12 a-b.

This species is rather common and shows many variations in thickness of shell, size, and sculpture. In general, our specimens are a little thinner than most specimens of *P. densata* from the Maryland Miocene.

Age: Miocene.

Locality: Districts of Democracia and Miranda, State of Falcón, locality numbers 6, 73, 78, 79, 80, 81, 82, 83, 83B, 84, 85, 93, 94, 95, 96, 97, 185, 186, 204, 220, 225, 229, 230, 234, 273, 1033, 1064, 1065, 1232, 1552, 1855, 1856, 1858, 1871, 1911.

? *Plicatula densata democraciana* F. and H. Hodson, n. subsp.

Pl. 24, figs. 3, 4, 7, 8.

? *Plicatula densata* Conrad, Cooke, 1919, Carnegie Inst. Washington, publ. no. 291, p. 145, pl. 11, fig. 12 a-b.

This subspecies differs in having a very thin shell, which reflects the exterior sculpture as pronounced undulations on the inside of the valves; the internal "ribs" correspond to the interspaces between the plicæ on the exterior of the valves. The pallial line usually cannot be detected in our specimens; the interior of the valves, instead of being smooth and porcelaneous, is roughened with submicroscopic,

radial striæ and, occasionally, faint, concentric lines of growth. Our subspecies is somewhat larger than the species, *sensu stricto*.

Age: Pliocene.

Locality: District of Democracia, State of Falcón, locality number 69.

Genus SPONDYLUS Linné

Spondylus falconensis Harris, n. sp. Pl. 23, figs. 4, 5; pl. 24, fig. 9.

Shell of medium size, inequivalve and somewhat oblique; surface markings consist of: (a) about 5 or 6 primary radii, heavily spined, (b) 5 to 10 secondary radii between the primaries, the middle one having a tendency to be strongest, (c) finer radii of various sizes; all radii strongly fimbriate or scaly.

Dr. Maury has given an excellent and detailed description of her *Spondylus lucasi*¹ and it would appear that *lucasi* and *falconensis* have much in common in detailed structure; but the small size of *lucasi* and its seeming lack of a half-dozen strongly spinose primary radii suggest noteworthy differences. Since the largest dimension for *lucasi* is 33 mm. and *falconensis* easily reaches 100 mm., we are dealing either with different species or very different stages of development in specimens. What is needed at present is good, enlarged, photographic illustrations of the exterior characteristics of *lucasi*.

The general aspect of the species is like that of *S. bostrychites* Sowerby as interpreted by Maury,² or *S. chiri-quiensis* Olsson.³

Age: Miocene.

Locality: Districts of Colina and Miranda, State of Falcón, locality numbers 121, 151, 180, 182, 206, 275, 1012.

¹ Scient. Surv., N. Y. Acad. Sci., vol. 3, 1920.

² Bull. Amer. Pal., vol. 5, pl. 58, fig. 4.

³ Bull. Amer. Pal., vol. 9, pl. 23, figs. 1, 3, 5, 6.

Spondylus carmenensis F. Hodson, n. sp. Pl. 25, figs. 1, 2, 3.

As in the case with most species of *Spondylus*, our form shows exceedingly great variations both in shape and sculpture. The average greatest altitude of our adult specimens is from 70–80 mm. The lower valve is very convex and deep. In the young stages, the flat valve is slightly convex, but soon becomes flat or even slightly concave. The beak of the lower valve extends moderately beyond the hinge line; both valves show a tendency to have striate, rather small ears. The radial sculpture in the convex valve consists of some 15–17 primary radials, which are occasionally rather hard to distinguish from the secondary radials, which typically occur about half-way between the primaries; the primaries, except those adjoining the sub-margins, tend to carry low, decumbent spines. Between the more prominent primary and secondary radials, there are 6 or more, small, scaly, tertiary threads which cover the interspaces; there are about 3–5 of these threads to the millimeter. The primary threads on the flat valve are closer together and usually bear low spines; between the primaries, there are secondary and, in well preserved specimens, scaly, tertiary threads; there are fewer tertiary threads between the larger ones than on the convex valve; the radial sculpture is crossed by close-set, slightly scaly growth lines.

The species is somewhat larger than *S. scotti* Brown and Pilsbry¹ and has a much flatter upper valve. It is much larger than *S. bostrychites* Guppy as interpreted by Cooke.²

Age: Oligocene.

Locality: District of Buchivacoa, State of Falcón, locality numbers 1649, 1967, 2436.

¹ Proc. Acad. Nat. Sci. of Philadelphia, 1912, p. 514, pl. 25, figs. 1–2.

² Carnegie Inst. of Washington, no. 291, 1919, p. 144, pl. 11, figs. 11a–b.

Family ANOMIIDÆ Gray

Genus ANOMIA Müller

Anomia gabbi falconensis F. Hodson, n. subsp.

Pl. 24, fig. 1; pl. 26, figs. 1, 2.

This subspecies is exceedingly like *A. gabbi* Pilsbry and Johnson¹ in general appearance and ornamentation. The difference lies in the position of the minor byssal scar. The two major scars are located, respectively, at the top and near the postreior basal part of the major, somewhat rectangular, muscle attachment area; the smaller byssal scar lies more or less between the two major scars; it is slightly anterior of a line connecting the centers of the two largest scars, and may be equidistant from them or slightly closer to the lower scar; thus, the minor scar is always somewhat above and in front of the lower major scar. In the description of the species *sensu stricto*, it is stated that the adductor impression is alongside the minor byssal scar, not lower down. Our subspecies is usually somewhat larger than *A. gabbi*. In some of our collections, the muscle scars are not well preserved, so that a few of our specimens may possibly belong to the species, *sensu stricto*.

Age: Miocene.

Locality: Districts of Miranda, Democracia and Colina, State of Falcón, locality numbers 70A, 71, 113, 219, 1227, 1233, 1500, 1856, 1861, 1862, 1863, 1875, 1889C (*cf.*), 1890, 1927, 2042 (*cf.*).

Anomia palmasensis F. Hodson, n. sp.

Pl. 24, figs. 2, 5, 6.

Only the upper valve of this species has been found. One of the most characteristic features of this species is its doubly selliform shape; one large, convex, altitudinal saddle-shaped depression is found on the exterior, extend-

¹ Proc. Acad. Nat. Sci. of Philadelphia, 1917, p. 193; Proc. Acad. Nat. Sci. of Philadelphia, 1921, p. 409, pl. 43, fig. 1.

ing from near the beak to the ventral margin; the other convex, transverse, selliform depression occurs on the inside of the valve and is caused by the turning up of the posterior and anterior edges of the valve; the two major, selliform folds are somewhat at right angles to each other. The altitudinal, selliform depression continues to the ventral margin, where it is produced as a sharp, subangular, depressed fold; the ventral part of the shell is frequently more pointed than the dorsal. The radial sculpture is variable, sometimes zigzagged, sometimes slightly imbricated along some of the concentric growth lines; it nearly always shows at least traces of secondary radials between the primaries in well preserved specimens. The muscle scars are located in a somewhat rectangular area along the internal ridge, which corresponds to the altitudinal, exterior, selliform depression; this area is very nearly central in its location; in it, there are two prominent scars, one being located at the top of the area, and the other near the base on the posterior side; the third is a medium-sized byssal scars, almost adjacent to, and alongside of, the prominent posterior basal scar, but not at all above it.

This species is somewhat like *A. gabbi* Pilsbry and Johnson (*loc. cit.*), but the striking and consistent difference in shape of the two shells makes it impossible to confuse them.

Age: Miocene.

Locality: District of Buchivacoa, State of Falcón, locality numbers 2267, 2278, 2392.

Anomia venezuelana Harris, n. sp. Pl. 23, figs. 2, 3; pl. 26, fig. 4.

Adult shell of rather large size; roundish but with a tendency to be drawn out posteriorly; shell substance rather thick, especially about the umbones; surface smooth about the umbones generally in young thin shells, but even on these there may be a suggestion of slight protuber-

ances arranged roughly in rows; surface irregularities become more pronounced in large old specimens and seem to suggest a close relationship with some forms of *ephippium*; the ribbing sometimes becomes strong enough even to suggest a distant relationship with *gabbi*.

Only the left or upper valves are represented in any of our material. They sometimes show an irregularity on the hinge margin just anterior to the beak, consisting of a slight tooth-like projection and socket-like notch.

Age: Miocene and Pliocene.

Locality: Districts of Democracia, Colina, Miranda and Falcón, State of Falcón, locality numbers 69, 71, 84, 85, 86, 202, 203, 1021, 1027, 1233, 1243, 1244, 1881, 1886, 1887 (*cf.*), 2206.

Family PHOLADOMYACIDÆ Gray

Genus PHOLADOMYA Sowerby

Pholadomya falconensis F. and H. Hodson, n. sp.

Pl. 26, fig. 6; pl. 27, figs. 1, 2.

The shell is very large, oblong, and not very ventricose for its size. The beaks are high, broad, almost contiguous, and located just behind the blunt, anterior extremity. The whole shell is ornamented with concentric ribs which are more pronounced on the umbones; the ribs are wider than the interspaces. The concentric sculpture is crossed by oblique, radial ribs, of variable strength; they become slightly farther apart and less pronounced on the posterior slope; the radial ribs are not found on the blunt, anterior end; the intersection of the concentric and radial ribs produces elevations or bumps.

This species is very large. It is much larger than *P. walli* Maury¹ and is much less ventricose.

Age: Miocene.

Locality: Districts of Colina and Democracia, State of Falcón, locality numbers 80, 131, 151, 205, 207, 260A, 1016.

¹ Bull. Amer. Pal., 1925, vol. 10, pp. 332-333, pl. 42, figs. 8-11.

Family CRASSATELLITIDÆ Dall

Genus CRASSATELLITES Kruger

Crassatellites aviaguensis F. Hodson, n. sp.

Pl. 28, figs. 4, 7, 8, 10.

The shell is large, somewhat elongate, and thick. The anterior end is shorter than the posterior, and the length of the shell somewhat greater than the height. The lunule is large, deeply impressed, and fairly wide; it is very variable in shape, length, width and depth; generally, it is deeply sunken and surrounded with a steep ledge; in specimens about 45 mm. in height, the lunule varies from 18 to 25 mm. in length, and from 6 to 10 mm. in width. The escutcheon is narrower and longer than the lunule; along the border of the escutcheon, on the posterior dorsal area of each valve, there are two small ridges (separated by a faint sulcus) which extend from the tip of the beak posteriorly. The thick shell is ornamented with rather evenly spaced, somewhat raised, concentric lines; this concentric sculpture tends to be slightly more elevated on the dorsal half of the valve than on the ventral; on the beaks, there are 4-6 concentric ribs or folds which are stronger than the succeeding ones.

Age: Oligocene.

Locality: District of Buchivacoa, State of Falcón, locality number 2447.

Crassatellites trinitarius venezuelanus F. Hodson, n. subsp.

Pl. 28, figs. 2, 6, 9.

Our form is closely related to *C. trinitarius* Maury¹ but is easily distinguished by certain differences: the lunule in the Venezuelan form is much shorter and wider; the shell is more excavated in front of the beaks. In the species, *sensu stricto*, the line from the beak to the anterior extremity is straight, but in this subspecies, there is a depression in front of the beaks.

¹ Bull. Amer. Pal., vol. 10, 1925, pp. 327-328, pl. 42, figs. 1, 7.

Age: Miocene.

Locality: Districts of Democracia, Miranda, Colina, Acosta and Buchivacoa, State of Falcón, locality numbers 81, 84, 86, 87, 89, 98, 112, 110, 150A, 150B, 163, 177, 187, 193, 206A, 216, 225A, 297, 298, 317, 329, 354, 1007, 1033, 1035, 1256, 1335, 1448, 1818, 1827, 1856, 1858, 1872, 1892, 1912.

Family CARDITIDÆ Gill

Genus VENERICARDIA Lamarck

Venericardia zuliana F. Hodson, n. sp. Pl. 28, figs. 1, 3, 5, 11.

Shell very small, convex, subcircular or slightly produced posteriorly in adult specimens. The beaks are somewhat inflated and located near the anterior third of the shell. The sculpture consists of 15–20 high, crested, closely nodulated ribs, somewhat narrower than the interspaces; usually, there are about 17 ribs in adult specimens; the interspaces are crossed by microscopic, irregular, concentric growth lines. The interior of each valve is deep; the margins are fluted internally.

This species is similar to its new subspecies *maracai-bensis*, but is smaller, and has a thinner shell, finer sculpture, and closer nodulation. Our species somewhat resembles a miniature form of *V. scabricostata* Guppy (*vide* Olsson¹) from Costa Rica, which usually has 18 instead of 17 ribs. *V. zuliana* (n. sp.) is always much smaller than any of the specimens commonly referred to *V. scabricostata* Guppy. Since our form is very common, there are many variations found in the different horizons and localities.

Age: Oligocene-Miocene.

Locality: District of Miranda, State of Zulia; Districts of Buchivacoa and Acosta, State of Falcón; locality numbers 6, 10, 25, 1070, 1140, 1419, 1939, 2035, 2040, 3207.

¹ Bull. Amer. Pal., 1922, vol. 9, p. 388.

Venericardia zuliana weeksi F. Hodson, n. subsp.

Pl. 29, figs. 2, 4, 5.

This subspecies is characterized by the valves being less deep and slightly longer for their height. The ribs are a little sharper and the interspaces correspondingly wider. The number of ribs and character of the nodding vary as in the species; there are usually 17 ribs. Figure 2 on plate 29 shows one of the many intermediate forms.

Named in honor of Mr. L. G. Weeks who helped collect some of this material.

Age: Oligocene-Miocene.

Locality: District of Miranda, State of Zulia, locality numbers 6, 1140.

Venericardia zuliana maracaibensis (Williston MS.) F. Hodson, n. subsp.

Pl. 26, figs. 3, 5; pl. 29, figs. 1, 7, 10.

This subspecies is larger and heavier than *V. zuliana* or *V. zuliana weeksi*, but is of the same general type. The valves are more produced posteriorly and are not quite as deep as in the species, *sensu stricto*. The ribs are broader and a little more rounded. The number of ribs varies from 15 to 19, but the usual number is 17. The nodulation on the ribs tends to be slightly coarser, the nodules larger and usually less closely spaced. The lunule is very small and deeply impressed.

This subspecies is a direct evolutionary outgrowth of *V. zuliana*; all intergradations between them are found.

Age: Miocene.

Locality: Districts of Democracia, Miranda, Acosta and Colina, State of Falcón, locality numbers 71, 74, 86, 87, 90, 93, 94, 96, 100, 118, 121, 149, 150A, 150B, 184, 185, 187, 205, 206A, 225A, 273 (?), 290, 291, 292, 295, 298, 1033, 1212, 1256, 1447, 1448, 1825, 1860 (?), 1870, 1872, 1931C (?), 2036.

Venericardia quirosana F. Hodson, n. sp.

Pl. 29, figs. 8, 12, 13.

Shell is rather small, subquadrate to subrectangular,

squarely truncate posteriorly. The beaks are prosogyrate and located near the anterior quarter of the shell. The hinge plate is not quite parallel to the ventral margin, but tends to converge with it anteriorly. The beaks are arched above the hinge area, and almost conceal the lunule, which is very small. The sculpture consists of about 20 strong ribs with deep interspaces; the ribs are supported on each side at the base by a small, auxiliary, strengthening riblet; the ribs are ornamented with numerous, regularly spaced, transverse nodes, which are as wide as the tops of the rather square ribs. The whole shell is covered with fine, concentric growth lines. The posterior slope carries a marked depression in which there are one or two small ribs, usually not noded. Between the posterior depression and the hinge area, there are 2-3 noded ribs. The hinge plate is narrow; the inner margin shows moderately deep fluting.

This species is easily distinguished from *V. islahispanolæ* Maury¹ by its fewer ribs, deeper interspaces, and more marked posterior depression. It is a much smaller species than *V. hadra* Dall or *V. himerta* Dall.²

Age: Oligocene-Miocene.

Locality: District of Miranda, State of Zulia; District of Urdaneta, State of Lara; District of Buchivacoa, State of Falcón, locality numbers 6, 815, 1140, 2019.

Venericardia quirosana venezuelana F. Hodson, n. subsp.

Pl. 29, fig. 11.

This subspecies is less elongate, the height is greater in proportion to the length, than in the species, *sensu stricto*. This is a very variable stock and all intergradations are found between the species and subspecies.

Age: Oligocene-Miocene.

Locality: District of Miranda, State of Zulia; District

¹ Bull. Amer. Pal., 1917, vol. 5, p. 362, pl. 59, fig. 2.

² Trans. Wagner Inst. of Science of Philadelphia, 1903, pt. 6, pp. 1429-1430.

of Acosta, State of Falcón; locality numbers 6, 1140, 1408.

Venericardia bowdenensis F. Hodson, n. sp. Pl. 29, figs. 6, 9.

Shell rather small, subquadrate, and ornamented with finely nodulated ribs. The posterior slope shows a very faint depression or flattening. The beaks are small and tend to overhang the small, impressed lunule. The sculpture consists of about 21 elevated, noded ribs, which bear an auxiliary supporting riblet on each side at the base. On each rib, there is a linear groove along the middle of each side; these grooves extend from the umbones to the ventral margin. The nodes on the ribs are very prominent and closely spaced; they originate near the groove on each side of the ribs and form sharply elevated, rounded nodes, which sometimes become sharply imbricated, especially on the posterior part of the shell. The valves are moderately deep and have a closely crenulated inner margin. The hinge plate is rather narrow.

This species has more numerous and more closely spaced ribs than our forms of the *V. quirosana* stock.

Age: Miocene.

Locality: Bowden Hill, Bowden, Morant Bay, Jamaica.

Venericardia olssoni F. Hodson, n. sp. Pl. 29, figs. 3, 14.

Shell large, coarsely ribbed, height greater than the length. The umbones are strongly arched; the lunule is small and deeply impressed. The sculpture consists of about 13 wide, low ribs with narrower, rather shallow interspaces. The concentric, undulating growth lines swing up gently over the low ribs and curve downward into the shallow interspaces. The hinge plate is rather heavy; the valves are fairly deep; the margins are coarsely crenulate.

This species somewhat resembles *V. terryi* Olsson,¹ but our form has much more pronounced ribbing and is a much larger shell.

¹ Bull. Amer. Pal., 1922, vol. 9, pp. 388-389, pl. 35, figs. 12, 13.

Age: Miocene.

Locality: Districts of Democracia and Colina, State of Falcón, locality numbers 83, 84, 137, 185.

Family CHAMIDÆ Lamarck

Genus CHAMA Linné

***Chama buchivacoana* F. Hodson, n. sp.** Pl. 30, figs. 3, 6, 9, 11, 12.

The shell is small, heavy, and attached by the right valve. The attached valve is deep and its beak is very much inflated and arched over the cardinal area. The whole valve superficially seems to be covered with crowded, irregular, vermicular papillæ; microscopically, the ornamentation appears to consist of more or less irregular, discontinuous radials, crossed by very irregular growth stages or prominences. The flat valve is ornamented with concentric growth flanges which are fluted and wrinkled. The muscle scars are elongate and not elevated.

Most of our better preserved specimens average about 20 mm. in altitude, but some exceed 30 mm.

Age: Oligocene.

Locality: District of Buchivacoa, State of Falcón, locality numbers 1216, 2379, 2394.

***Chama quirosana* F. Hodson, n. sp.** Pl. 30, figs. 1, 2, 5, 7.

Shell small, attached by right valve, which is irregularly oblong. The attached valve has a ridge extending from the middle of the umbo to the ventral margin; this ridge divides the outside of the valve into two approximately equal parts; the top of the ridge bears a few low, imbricating scales at its intersection with growth lines; the scales extend from the ridge posteriorly; near the posterior margin, there is another row of decumbent scales, which obliquely crosses the close-set, papillate, faint, radial ribs; the main ridge extends to the inflated umbo as a sharp angulation; there are some imbricating scales on the anterior basal area. The attached valve is deep, and the rather elongate muscle scars are not elevated or very con-

spicuous. The free valve has not been found with certainty, but fragments of a free valve occurring in the same bed have the appearance of belonging to this species; the fragments show the valve to be thin, moderately deep, and bearing concentric waves of decumbent spines at least on the posterior extremity.

Age: Oligocene-Miocene.

Locality: District of Miranda, State of Zulia, locality number 6.

Chama berjadinensis F. Hodson, n. sp.

Pl. 30, figs. 4, 8, 10; pl. 31, figs. 2, 3, 5.

Shell is medium-sized, averages 35–45 mm. in altitude, is usually attached by the left valve, and has a small area of attachment near the beak; our biggest specimens measure 60 mm. in height. The attached valve is moderately deep; its curved beak is somewhat inflated and moderately elevated above the cardinal area. In the attached valve, the whole periphery of the internal margin, except the cardinal area, is closely denticulate with pronounced parallel striae which are about at right angles with the peripheral edge of the valve. The elongate muscle scars are of moderate size. The most characteristic feature of the attached valve is the peculiar, irregular, radial, almost vermicular, papillate, close-set ribbing, especially noticeable in young specimens; the radial sculpture is crossed by irregular, concentric growth stages, which frequently interrupt the continuity of the radial ribs; in the more adult stages, the radial ribs become wider and the concentric lines frequently tend to produce short, decumbent spines and scales. The free valve is moderately shallow and shows fine radial sculpture of the same general type as on the other valve, but in the adult stages, the radial ribs tend to be narrower than on the attached valve.

Age: Miocene.

Locality: Common in the State of Falcón, locality

numbers 24, 74, 75, 79, 80, 81, 84, 88A, 90, 92, 93, 94, 95, 98, 120B, 121, 122A, 184, 185, 193, 206A, 216, 225, 281, 299, 317, 341, 1007, 1017, 1064, 1065, 1078, 1335, 1842, 1869, 1870, 1872, 1892, 1897, 2377, 2386, 2391, 4615.

Family VENERIDÆ Leach

Genus DOSINA Scopoli

Section DOSINIDIA Dall

Dosinia elegans venezuelana H. K. Hodson, n. subsp.

Pl. 32, figs. 1, 4.

This subspecies is very similar to *D. elegans* (Conrad),¹ but it is proportionately higher, and has a thicker shell. The lunule is slightly larger, measuring about 8 mm. by 5 mm. in a shell about 56 mm. in height. *D. acetabulum* (Conrad)² is less produced anteriorly, has a lower beak, and is thinner.

This is an abundant species but almost never well preserved. Our largest specimen measures: height 65 mm., length 68 mm., diameter of both valves 31 mm.

Age: Miocene.

Locality: Districts of Colina, Miranda, Democracia, Acosta and Buchivacoa, State of Falcón, locality numbers 75, 80, 81, 84, 122B, 126, 131, 138C, 149B, 154, 155, 169A, 174, 178, 185, 205, 215, 219, 261, 281 283, 287, 317, 329, 339, 359, 1017, 1043, 1111, 1325, 1334, 1335, 1411, 1552, 1703, 1793, 1825, 1827, 1829, 1831, 1943.

Genus CLEMENTIA Gray

Clementia dariena (Conrad)

Pl. 32, fig. 3.

Meretrix dariena Conrad, 1855, U. S. Pacific R. R. Expl., vol. 5, pt. 2, appendix, p. 328, pl. 6, fig. 55.

Clementia dariena (Conrad), Gabb, 1881, Jour. Acad. Nat. Sci. of Philadelphia, 2d ser., vol. 8, p. 344, pl. 44, figs. 16, 16a.

Clementia dariena (Conrad), Dall, 1903, Trans. Wagner Free Inst. Sci. of Philadelphia, vol. 3, pt. 6, p. 1235.

Clementia dariena (Conrad), Toulou, 1909, Jahrb. der k.-k. Geol. Reich., vol. 58, (1908), pp. 725-726, pl. 27, figs. 9-10.

¹ Proc. Acad. Nat. Sci. of Philadelphia, 1843, vol. 1, p. 325.

² Fossil Shells of the Tertiary Formations, 1832, p. 20, pl. 6, fig. 1.

- Clementia dariena* (Conrad), Brown and Pilsbry, 1911, Proc. Acad. Nat. Sci. of Philadelphia, vol. 63, p. 371, pl. 28, fig. 1.
- Clementia rabelli* Maury, 1920, New York Acad. of Sciences, Scientific Survey Porto Rico and Virgin Islands, vol. 3, pt. 1, pp. 37-38, pl. 6, figs. 2-3.
- Clementia dariena* (Conrad), Hubbard, 1921, New York Acad. of Sciences, Scientific Survey Porto Rico and Virgin Islands, vol. 3, pt. 2, (1920), pp. 118-120, pl. 19, figs. 10-12.
- Clementia dariena* (Conrad), Olsson, 1922, Bull. Amer. Pal., vol. 9, pp. 404-405, pl. 34, fig. 4.
- Clementia dariena* (Conrad), Spieker, 1922, Johns Hopkins Univ., Studies in Geology, No. 3, pp. 141-143, pl. 8, fig. 5.
- Clementia* sp. cf. *C. dariena* (Conrad), Woods, 1922, in Bosworth and others, Geology of the Tertiary and Quaternary Periods in the North-west Part of Peru, p. 113, pl. 20, figs. 4a, 4b, London.
- Clementia dariena* (Conrad), Maury, 1925, Bull. Amer. Pal., vol. 10, pp. 293-294, pl. 37, figs. 1, 3, 5-7.
- Clementia dariena* (Conrad), Harris, 1926, in Waring, Johns Hopkins Univ., Studies in Geology, No. 7, p. 110, pl. 20, fig. 8.
- Clementia* (*Clementia*) *dariena rabelli* Maury, Woodring, 1926, Prof. Paper 147, U. S. Geol. Survey, p. 34, pl. 14, fig. 5.
- Clementia* (*Clementia*) *dariena dariena* (Conrad), Woodring, 1926, Prof. Paper 147, U. S. Geol. Survey, pp. 34-36, pl. 14, figs. 6-11.

We have exceedingly abundant collections of this species. As with most thin-shelled forms, this species is extremely variable and easily distorted; it is represented by casts more often than not. Dr. Maury's species seems to us to be only a variation which can be duplicated in almost any large collection of *Clementia dariena* throughout a wide range stratigraphically and geographically.

Age: Oligocene and Miocene.

Locality: Common in the State of Falcón; Gatun, C. Z.; locality numbers 29, 32, 75, 78, 79, 83, 85, 86, 100, 132, 141, 149B, 150A, 169, 172, 173, 174, 193, 198, 221, 261, 264, 283, 290, 292, 306, 313, 317, 323, 329, 332, 341, 354, 358, 406, 440 (cf.), 815, 919, 1015, 1017, 1069, 1073, 1256, 1265, 1266 (?), 1434, 1702, 1736, 1740, 1751, 1789, 1792, 1793, 1797, 1799, 1800, 1805, 1818, 1820, 1839, 1849, 1859, 1860, 1864, 1865, 1874, 1876, 1877, 1878A, 1897, 1898B, 1911, 1931C, 1936, 2005, 2019, 2019A, 2021, 2027, 2046, 2048, 2050 (cf.), 2207.

Genus **MACROCALLISTA** Meek**Macrocallista maculata** (Linné)

Pl. 32, fig. 6.

Venus maculata (Linné), 1758, Syst. Nat., 10th ed., p. 686; 1767, 12th ed., p. 1132.*Cytherea maculata* (Linné), Lamarck, 1818, Anim. sans Vert., vol. 5, p. 566.*Cytherea maculata* (Linné), Sowerby, 1842, Conch. Man., fig. 117d.*Cytherea dariena* Conrad, 1857, Pacific R. R. Rept., vol. 6, p. 72, pl. 5, fig. 21.*Dione maculata* (Linné), Reeve, 1863, Conch. Icon., *Dione*, pl. 3, figs. 11a, 11b.*Callista maculata* (Linné), Gabb, 1881, Jour. Acad. Nat. Sci. of Philadelphia, 2d ser., vol. 8, p. 344.*Macrocallista* (*Chionella*) *maculata* (Linné), Dall, 1903, Trans. Wagner Free Inst. Sci. of Philadelphia, vol. 3, p. 1256.*Macrocallista* (*Paradione*) *maculata* (Linné), Maury, 1920, Bull. Amer. Pal., vol. 8, p. 100.*Macrocallista maculata* (Linné), Olsson, 1922, Bull. Amer. Pal., vol. 9, pp. 406-407, pl. 34, figs. 6, 7.*Macrocallista* (*Chionella*) *maculata* (Linné), Maury, 1925, Bull. Amer. Pal., vol. 10, pp. 297-298, pl. 36, figs. 1, 4, 5.

This species is common and shows many variations, as might be expected when a large number of specimens are examined. Our larger adult specimens frequently attain 55 mm. in length.

Age: Miocene.

Locality: Districts of Democracia, Colina, Miranda, Acosta and Buchivacoa, State of Falcón; Cartagena, Colombia; locality numbers 70A, 70C, 72, 86, 97, 122B, 131, 154, 155, 178, 185, 215, 248, 307, 254, 1102, 1013, 1033, 1035, 1232, 1825, 1827, 1831, 1839, 1856, 1892, 1908, 1912, 1928, 1931C.

Genus **PITARIA** (Römer)Subgenus **GILBERTHARRISELLA** F. and H. Hodson, new subgenus

The shell is large, very thick, with its height about equal to its length. The beak is high and inflated. The external sculpture consists of concentric folds. The lunule is large and defined by an incised line; the escutcheon is not well defined. The pallial sinus is small, narrow, and does not reach the middle of the shell. The ridge behind the muscle

scar is heavy and strongly elevated. The anterior lateral lamella is peg-like and received in a pit in the high valve. The type of this new subgenus is *P. (Gilbertharrisella) lynei* F. and H. Hodson, n. sp.

Named in honor of Prof. G. D. Harris.

Pitaria (Gilbertharrisella) lynei F. and H. Hodson, n. sp.
Pl. 33, figs. 3, 5.

Shell thick, valves deep, umbones inflated. The lunule is large, cordate, and limited by a faint line near the beaks, but less distinctly demarked ventrally. The escutcheon is deep and rounded. The hinge plate is thick; the teeth are large. The anterior muscle scar is large, deeply impressed, and limited interiorly by a thickened ridge which becomes weaker ventrally. The posterior muscle scar is large but not impressed. The pallial sinus is low, rounded on top and pointed at the end. There is a gentle depression along the posterior slope adjacent to the escutcheon, but separated from it by a low ridge. The sculpture consists of concentric, flattered folds.

Named in honor of Mr. H. S. Lyne who collected the material.

Age: Upper Cretaceous.

Locality: District of Perijá, State of Zulia, locality number 2220.

Subgenus **PITARIA** s. s.

Pitaria (Pitaria) quirosana H. K. Hodson, n. sp. Pl. 32, figs. 2, 5.

The shell is thin, small, somewhat trigonal, produced posteriorly, polished. The lunule is small and defined by an incised line. The escutcheon is obscure. The beak is situated at about the anterior fourth of the shell. Posteriorly from the beak, a rounded keel extends to the margin. The pallial sinus is wide and extends forward more than half the length of the shell.

Age: Oligocene-Miocene.

Locality: District of Miranda, State of Zulia; District of Acosta, State of Falcón; locality numbers 6, 1419.

Pitaria (Pitaria) colinensis H. K. Hodson, n. sp. Pl. 33, figs. 4, 6.

The shell is large, ovate, inflated and ornamented with close-set concentric lines, which grow coarser toward the basal margin. The beak is low and situated at about the anterior seventh of the shell. The lunule is wide, cordate, defined by an incised line, and sculptured like the rest of the shell. The escutcheon is poorly defined, similarly sculptured, and abruptly raised at its peripheral margin. The interior of the shell is concealed by the matrix.

This species is more ovate than *P. gatunensis* (Dall)¹ and *P. paraguaneensis* (n. sp.).

Age: Miocene.

Locality: District of Colina, State of Falcón, locality numbers 123, 204, 205.

Pitaria (Pitaria) paraguaneensis H. K. Hodson, n. sp. Pl. 33, fig. 1.

The shell is large, heavy, trigonal, and ornamented with close-set, concentric, raised lines, which become coarser toward the ventral margin. The beak is situated at about the anterior fifth of the shell and is moderately high. The lunule is cordate, wide, defined by an incised line, and sculptured like the rest of the shell. The escutcheon is poorly defined, similarly ornamented, and slightly raised at the peripheral margin. The interior of the shell is concealed by the matrix.

This species is more trigonal than *P. colinensis* (n. sp.) and *P. gatunensis* (Dall) (*loc. cit.*), and its beaks are situated a little more posteriorly.

Age: Miocene.

Locality: District of Falcón, State of Falcón, locality number 2207.

¹ Trans. Wagner Free Inst. Sci., 1903, vol. 3, pt. 6, pp. 1260-1261, pl. 54, fig. 1.

Pitaria (Pitaria) buenavistana H. K. Hodson, n. sp. Pl. 33, fig. 2.

The shell is of medium size, high, plump, ornamented with concentric sculpture which is not much stronger than growth lines. The lunule is large, cordate, and ornamented like the rest of the shell. The beak is high and situated a little back of the anterior fourth of the shell.

The species is rare and usually poorly preserved, due to its thin shell.

Age: Miocene.

Locality: District of Colina, State of Falcón, locality number 123.

Pitaria buenavista coroana H. K. Hodson, n. subsp. Pl. 33, fig. 7.

This subspecies is smaller than *P. buenavista* (n. sp.) and carries a depression behind the beak as well as in front of it. The beak is higher than in the species and is situated at about the anterior four-tenths of the length of the shell. The sculpture is about the same as that of the species.

Possibly, *P. buenavista coroana* (n. subsp.) should be of specific rank, but some of the specimens, although poorly preserved, seem to be intergradations between this form and *P. buenavista*.

Age: Miocene.

Locality: District of Colina, State of Falcón, locality numbers 122B, 155, 1335, 1552.

Subgenus HYPHANTOSOMA Dall

Pitaria (Hyphantosoma) mirandana H. K. Hodson, n. sp. Pl. 31, fig. 1.

The shell is small, somewhat trigonal, covered with the zigzag markings typical of the subgenus. The lunule is long, lanceolate, sculptured similarly to the rest of the shell. The escutcheon is poorly defined, strongly sculptured. The beak is low and smooth.

This species is very small, attaining only about 20 mm. in height. It is shaped something like *P. carbacea lavelana* (n. subsp.), but is more produced posteriorly. Very

few specimens have been found.

Age Oligocene-Miocene.

Locality: District of Miranda, State of Zulia, locality number 6.

Pitaria carbacea lavelana H. K. Hodson, n. subsp.

Pl. 34, figs. 6 7.

This subspecies is larger than *P. carbacea* (Guppy),¹ attaining 45 mm. in height instead of 32 mm. The lunule is marked with radial sculpture as well as concentric, which is not found in the Bowden form. The shape is much the same as that of the species. In the larger shells, the concentric sculpture is very coarse near the margin and stronger than the radial.

Age: Miocene.

Locality: District of Colina, State of Falcón, locality numbers 122B, 123, 155, 204, 1335.

Genus ANTIGONA Schumacher

Section VENTRICOLA Römer

Antigona palmeræ H. K. Hodson, n. sp.

Pl. 31, figs. 6, 7; pl. 35, fig. 8.

The shell is small, moderately inflated, posteriorly produced, ornamented with rather close-set, sharp, concentric, recurved lamellæ, which are separated by several fine secondary lines. The beaks are low. The lunule is cordate, long and narrow, covered with coarse lines marking the extensions of the lamellæ which cover the main part of the shell. The escutcheon is narrow, depressed and practically smooth. Although this is an abundant species, the exact shape of the shell cannot be determined as all of the specimens are more or less distorted or broken.

This species is very similar to the larger species, *A. blandiana* (Guppy),² but the beaks are much lower; the lunule is longer, more coarsely marked, and not depressed; the anterior is less produced.

¹ Quart. Journ. Geol. Soc. London, 1866, vol. 22, p. 292, pl. 18, fig. 13.

² Proc. Sci. Assoc. Trinidad, 1873, vol. 3, pp. 85-86, pl. 2, fig. 8.

Named in honor of Dr. Katherine Van Winkle Palmer.

Age: Oligocene-Miocene.

Locality: Districts of Buchivacoa and Acosta, State of Falcón; Districts of Miranda and Bolívar, State of Zulia; locality numbers 15, 29, 41, 777, 782, 1070, 1075C, 1080, 1221, 1408, 1436, 1437, 2016, 2046, 2265, 2266, 2268, 2269, 2274, 2447, 3205, 3207, 3251, 3352.

Genus CYCLINELLA Dall

Cyclinella falconensis H. K. Hodson, n. sp. Pl. 34, fig. 2.

The shell is small, suborbicular, ornamented with close-set, fine, concentric lines. The lunule is lanceolate, measuring about 10 mm. by 4.5 mm. on a shell about 34 mm. in height. The external margins of adjacent valves meet in an acute angle in the lunule. The beaks are low and only slightly raised above the outline of the shell.

The proportions and shape of the shell of this species are much like those of *C. venezuelana* (n. sp.), but the latter is larger and has a v-shaped depression instead of a sharp angular ridge where the margins of the valve meet in the lunule.

Age: Oligocene and Miocene.

Locality: Districts of Democracia, Buchivacoa and Acosta, State of Falcón, locality numbers 86, 1411, 1748, 1793, 1795.

Cyclinella venezuelana H. K. Hodson, n. sp. Pl. 34, figs. 3, 4.

The shell is large, plump, ornamented with slight folds which are scarcely more than growth lines. Toward the basal margin, the growth becomes irregular, making the shell thin and thicker periodically, forming little terraces in the sculpture. The shell is produced anteriorly, and is fullest along a line extending somewhat obliquely from the beak to the ventral margin; the beak is only slightly in front of the center of the shell. The lunule is lanceolate and measures about 12 mm. by 7 mm. on a shell about 45 mm. high.

This species is larger than *C. cyclica* (Guppy),¹ *C. gatumensis* Dall² and *C. cyclica domingensis* Pilsbry and Brown.³ It differs from the first and last in shape, and is much thicker than *C. gatumensis* Dall. None of the adult specimens are perfectly preserved.

Age: Miocene.

Locality: Districts of Colina and Falcón, State of Falcón, locality numbers 281, 1073, 2207.

Genus CHIONE Megerle von Mühlfeld

Subgenus CHIONE s. s.

Chione (Chione) montañitensis H. K. Hodson, n. sp. Pl. 35, fig. 3.

The shell is of medium size, elongate, produced posteriorly in a kind of nose. In front of this posterior swelling, is a depression which is reflected in the ventral margin by a sinus. The concentric sculpture consists of very thin flanges, which occur closer together in the adult stages, running from the lunule to the escutcheon. The radial dominates over the concentric sculpture, and flutes the concentric flanges as strongly as the interspaces between them. These flanges are mostly broken off in all of our specimens, but judging from the fragments of them preserved, they either slope down or stand straight out from the shell, and do not curl up. The lunule is defined by a sharply incised line, and is unornamented except for growth lines. The escutcheon is impressed and carries only growth lines. The inside of the shell cannot be seen as all of the specimens consist of two valves fastened together in the matrix. The largest specimen found measures about 36 mm. in length.

The distinguishing mark of this species is the posterior nose with a depression and sinus in front of it.

¹ Quart. Journ. Geol. Soc. London, 1866, vol. 22, p. 282, pl. 26, fig. 15a-b.

² Trans. Wagner Free Inst. Sci., 1903, vol. 3, pt. 6, p. 1285, pl. 52, fig. 18.

³ Proc. Acad. Nat. Sci. of Philadelphia, 1921, p. 424, pl. 47, fig. 8.

Age: Oligocene-Miocene.

Locality: District of Buchivacoa, State of Falcón; District of Urdaneta, State of Lara; locality numbers 440, 1939,

Chione (Chione) buchivacoana H. K. Hodson, n. sp. Pl. 35, fig. 1.

The shell is small, thin, elongate, ornamented with predominately radial sculpture. The posterior is somewhat produced and pinched. The lunule is lanceolate, defined by a sharply incised line. The concentric sculpture is fluted by the radial, but whether there were once wide flanges cannot be determined; the concentric ornamentation and growth lines extend over the lunule and large escutcheon, but are here uninterrupted by radial lines. The rays are prominent and bifurcate as the shell growth.

This species is much thinner than *C. montañitensis* (n. sp.) and lacks the posterior sulcus and swelling.

Age: Oligocene-Miocene.

Locality: District of Buchivacoa, State of Falcón, locality numbers 2490A, 3233.

Chione (Chione) cancellata (Linné) Pl. 35, fig. 5.

Venus cancellata Linné, 1767, Syst. Nat., ed. XII, p. 1130.

Chione cancellata (Linné), Dall. 1903, Trans. Wagner Free Inst. Sci., vol. 3, pp. 1290-1291.

Chione cancellata (Linné), Maury, 1920, Bull. Amer. Pal., vol. 8, no. 34, pp. 72-73.

Chione cancellata (Linné), Maury, 1925, Bull. Amer. Pal., vol. 10, no. 42, pp. 153-154, pl. 28, figs. 1, 5.

This common species occurs in Venezuela in the Miocene as well as from Pliocene to Recent. The specimens in the Miocene are small or medium in size, while those in the Quaternary are largest.

Age: Miocene-Recent.

Locality: Districts of Falcón, Democracia and Colina, recent along coast, State of Falcón; Districts of Paé, State of Zulia; locality numbers 82, 93, 94, 97, 426, 1265, 1504

Chione (Chione) paraguayensis H. K. Hodson, n. sp.

Pl. 35, figs. 2, 7.

The shell is sigh, inflated, produced posteriorly. The concentric sculpture is more conspicuous, consisting of numerous, close-set, fluted, concentric flanges, which point sharply upward, except on the very posterior and in the young stages where they stand straight out. The lunule and escutcheon are unornamented except for growth lines. The lunule is cordate; the escutcheon is depressed.

The high beak, acute posterior production, and close-set concentric laminae easily distinguish this shell. Some specimens attain 37 mm. in height, as indicated by fragments, but the better preserved ones measure only about 26 mm.

Age: Miocene.

Locality: Districts of Democracia, Colina, Falcón and Miranda, State of Falcón, locality numbers 90, 94, 1507, 1892, 2207.

Subgenus LIROPHORA Conrad

Chione (Lirophora) quirosensis H. K. Hodson, n. sp. Pl. 35, fig. 9.

The shell is of moderate size, trigonal, ornamented with wide, thin flanges, which are widely separated. These flanges extend from near the lunule to the ridge which demarks the escutcheon and point straight out or are somewhat curved up. The lunule is elongate and marked only with growth lines and faint traces of the concentric flanges. The escutcheon is depressed and carries only growth lines.

This *Chione* is common but nearly always poorly preserved.

Age: Oligocene-Miocene.

Locality: Districts of Buchivacoa, Democracia and Falcón, State of Falcón; Districts of Bolívar and Miranda, State of Zulia; District of Urdaneta, State of Lara; locality numbers 6, 7, 10, 811, 1128, 1288, 1289, 1290, 1405A, 1736, 7160, 2201, 2258, 2266, 2271, 2382, 2447A, 3208, 3218, 3219, 3247, 3251, 3330.

Chione quirosensis queralana H. K. Hodson, n. subsp. Pl. 34, fig. 1

This subspecies is very much larger than *C. quirosensis* (n. sp.). It has more concentric flanges than the latter, and in an adult shell, these are crowded very closely together at the margin.

Age: Oligocene and Miocene.

Locality: Districts of Buchivacoa, Miranda, Democracia and Federación, State of Falcón, locality numbers 257, 339, 342, 400, 1042, 1282, 1628, 1705, 1705A, 1792, 1934, 1936.

Chione (Lirophora) cartagenensis H. K. Hodson, n. sp.

Pl. 31, fig. 4; pl. 35, fig. 6.

The shell is of medium size, trigonal, and ornamented with numerous, almost confluent ribs, which are wide in the young stages and of various width in the adult. The ribs extend from the lunule, or very near it, to an area near the escutcheon, where they continue to the posterior ridge as low flanges. Anteriorly, the edge of the ribs is inclined to curl up in a thin flange, and in adult shells, the last few folds carry a somewhat thinner upper edge. The lunule is deeply impressed, lanceolate, and ornamented with only growth lines. The escutcheon is sharply defined and likewise carries only growth lines. Radial sculpture is lacking exteriorly as the shell does not carry even pits below the concentric folds.

Most of the specimens are small, but one attain 26 mm. in height. The ribs of this species are more confluent than in *C. chiriquiensis* Olsson.¹

Age: Miocene.

Locality: Cartagena, Colombia.

Chione (Lirophora) falconensis H. K. Hodson, n. sp.

Pl. 35, fig. 10.

The shell is of medium size, plump, produced posteriorly, and ornamented with numerous narrow folds. The ribs are low and extend from near the lunule to an area

¹ Bull. Amer. Pal., 1922, vol. 9, no. 39, p. 248, pl. 32, figs. 9, 10.

in front of the escutcheon, where they become narrow, downward pointing flanges. At the base of each rib is a row of pits, representing the radial sculpture. The lunule is cordate, crossed only by growth lines and slightly heavier lines which are continuations of the concentric ribs. The escutcheon is sharply defined and similarly marked.

This common Venezuelan species has very different ribbing from *C. hendersoni* Dall, has a larger lunule, and is proportionately longer for its height. It is nearly always poorly preserved. The shell attains 26 mm. in height but is usually smaller.

Age Miocene.

Locality: Districts of Buchivacoa, Democracia, Colina and Acosta, State of Falcón, locality numbers 82, 90, 93, 185, 1005, 1335, 2386, 2412, 2413, 2801, 4615.

Chione (Liophora) matarucana H. K. Hodson, n. sp.

Pl. 35, fig. 4.

The shell is small, high, rather flat, and shaped like an *Astarte*. It is ornamented with numerous narrow folds which extend from very near the lunule to the escutcheon. The lunule and escutcheon carry only growth lines. The right valve laps widely over the left along the escutcheon.

C. matarucana (n. sp.) resembles most closely a specimen in the Newcomb collection at Cornell University, which is labeled *C. brongniartii* Payraudeau from the Mediterranean. The fossil species is larger and more produced posteriorly.

Age: Miocene.

Locality: District of Colina, State of Falcón, locality numbers 192, 203, 1020, 1242.

Chione (Liophora) wiedenmayeri H. K. Hodson, n. sp.

Pl. 34, fig. 5.

The shell is large, high, produced posteriorly and inflated. The ornamentation is low and inconspicuous, with the radial and concentric of about equal strength, similar to that of *Chione mactropsis* (Conrad).¹ The lunule is

¹ *Fide* Olsson, Bull. Amer. Pal., vol. 9, 1922, pp. 417-418, pl. 33, figs. 7, 8.

large and crossed with only growth lines. The escutcheon is large and depressed.

This species is quite rare and most of the specimens are poorly preserved. It differs from *C. mactropsis* mainly in its proportionately greater height, and it lacks the anterior foliaceous area of both *C. mactropsis* (Conrad) and *C. holocyma* Brown and Pilsbry;¹ also, it has a larger lunule and a depressed escutcheon. The general shape resembles that of *C. paraguayensis* (n. sp.). The largest specimen found measures about 38 mm. in height.

Named in honor of Dr. C. Wiedenmayer, who collected most of the specimens.

Age: Miocene.

Locality: District of Buchivacoa, State of Falcón, locality numbers 1934, 2267, 2272, 2282.

Chione (Lirophora) buenavista H. K. Hodson, n. sp. Pl. 36, fig. 11.

The shell is large, very heavy, ornamented with flat, confluent ribs of various widths. These ribs terminate in thin flanges which are usually broken off. The radial sculpture is very slight, so that some specimens with the lateral flanges broken off look something like a *Pitaria* or *Macrocallista*. The lunule is set far under the beak and crossed with only growth lines. The escutcheon is demarked by a ridge and is likewise unornamented.

The radial ornamentation of this species is less strong than that of *C. mactropsis* (Conrad) (*loc. cit.*) and *C. holocyma* Brown and Pilsbry (*loc. cit.*), and the lunule is more excavated.

Age: Miocene.

Locality: Districts of Colina, Democracia and Acosta, State of Falcón, locality numbers 97, 120B, 121, 127, 154, 155, 179, 180, 189, 204, 1335, 1448.

¹ Proc. Acad. Nat. Sci. of Philadelphia, 1911, vol. 63, p. 369.

Class GASTROPODA Cuvier

Family SOLARIIDÆ Chenu

Genus ARCHITECTONICA Bolten

Architectonica granulata (Lamarck)

Pl. 36, fig. 7.

Solarium granulatum Lamarck, 1822, Anim. sans Vert., 7, p. 3; 1792, Ency Méthod., pl. 446, fig. 5a-b.

Architectonica perspectiva Tuomey and Holmes, 1857, Pleioc. Fos. S. Car., p. 120, pl. 26, fig. 6. Not *S. perspectiva* Linné, nor of Lamarck.

Solarium granulatum Lamarck, Dall, 1892, Trans. Wagner Free Inst. Sci. of Philadelphia, vol. 3, p. 329.

Solarium Villarelloii Böse, 1906, Inst. Geol. de Mexico, numero 22, pp. 30-31, pl. 3, figs. 4-11.

Solarium gatunense Toulou, 1909, Jahrb. der k.-k. Geol. Reichsanstalt, Wien, vol. 58, (1908), pp. 692-693, pl. 25, fig. 3.

Solarium granulatum Lamarck, Maury, 1917, Bull. Amer. Pal., vol. 5, no. 29, p. 131, pl. 23, fig. 3.

Architectonia granulata (Lamarck), Maury, 1922, Bull. Amer. Pal., vol. 9, no. 38, p. 108.

Architectonia granulata (Lamarck), Olsson, 1922, Bull. Amer. Pal., vol. 9, no. 39, p. 154, pl. 13, figs. 10, 11, 12.

Architectonia granulata (Lamarck), Maury, 1925, Bull. Amer. Pal., vol. 10, p. 388, pl. 51, fig. 1.

This is a common and variable species, which occurs in many of our collections. Forms commonly referred to *A. quadriseriata* (Sowerby) seem to us to be a little more than a flatter subspecies of *A. granulata*, and intergrade with it; there are all intermediate forms between them. Our adult specimens usually average 20-25 mm. in diameter.

Age: Oligocene and Miocene.

Locality: Common in the State of Falcón; District of Miranda, State of Zulua; Gatun, C. Z.; Bowden, Jamaica; locality numbers 6, 84, 85, 100, 131, 149, 149B, 150A, 150B, 154, 163, 169A, 178, 184, 185, 189, 215, 291, 341, 1017, 1033, 1255, 1815, 1818, 1825 (?), 1827, 1856, 1858, 1892, 1934, 1936, 1943, 2027, 2207, 2375, 2386, 2391, 2420, 2447A, 2475, 2823, 3214, 3241, 4614, 4615, 4619, 4620.

Family NATICIDÆ Forbes

Genus SINUM Bolten

Sinum quirosanum F. Hodson, n. sp.

Pl. 36, figs. 10, 12.

Shell is small, flaring, consisting of about $4\frac{1}{2}$ whorls. The first 2 whorls are smooth; the others are covered with fine, irregular, zigzag, spiral lines. The greatest altitude is about equal to the greatest diameter. The pillar is short, being about one-third the total altitude of the shell. The aperture is large, oval, and in a specimen 10 mm. in greatest diameter, the height is about 8 mm. and the width about 6 mm.; the inner margin of the aperture is flaring and produces a ridge so that there is a depression between the basal part of the body whorl and the inner lip; there is no umbilical chink.

This species is somewhat similar to *S. imperforatum* Dall¹ in size and general appearance, but our species is not as high for its width.

Age: Oligocene-Miocene.

Locality: District of Miranda, State of Zulia, locality number 6.

Genus NATICA Scopoli

Natica guppiana Toulà

Pl. 36, figs. 1, 4.

Natica (*Stigmaulax*) *Guppiana* Toulà, 1909, Jahrb. der k.-k. Geol. Reichsanstalt, Wien. vol. 58, (1908), pp. 696-697, pl. 25, fig. 6.

Natica guppyana Toulà, Brown and Pilsbry, 1911, Proc. Acad. Nat. Sci. of Philadelphia, vol. 63, p. 360.

Natica Guppyana Toulà, Olsson, Bull. Amer. Pal., vol. 9, pp. 328-329, pl. 16, figs. 13-15.

Our collection shows this species to be quite variable and frequently the axial grooves or sulcations are farther apart than in typical *N. guppyana*.

Age: Miocene.

Locality: District of Colina, State of Falcón, locality numbers 185, 1033.

¹ Bull. 90, U. S. Nat. Museum, 1915, p. 109, pl. 5, fig. 8.

***Natica canrena* (Linné) Mörch**

- Natica canrena* (Linné, *partim*) Moersch, 1877, Malak. Blatt. 24, p. 62.
Natica canrena (Linné) Mörch, Dall, 1892, Trans. Wagner Free
 Inst. Sci. of Philadelphia, vol. 3, pp. 364-365.
Natica canrena (Linné), Brown and Pilsbry, 1912, Proc. Acad. Nat.
 Sci. of Philadelphia, p. 508.
Natica canrena (Linné) Moersch, Maury, 1917, Bull. Amer. Pal., vol. 5,
 pp. 298-299, pl. 49, fig. 10.
Natica canrena (Linné) Olsson, 1922, Bull. Amer. Pal., vol. 9, p. 327,
 pl. 16, fig. 9.
Natica canrena (Linné) Moersch, Maury, 1925, Bull. Amer. Pal.
 vol. 10, pp. 390-391, pl. 51, fig. 8.

Our fossil specimens closely resemble the recent which are rather common along the north coast of the State of Falcón.

Age: Miocene-Recent.

Locality: Districts of Falcón and Colina, State of Falcón; Bowden, Jamaica; locality numbers 163, 185, 1033, 1109, 1255, 2207.

Natica precanrena F. Hodson, n. sp.

Pl. 36, figs. 2, 6, 9.

Shell is small with about 5 rounded whorls. This species is smaller and has a higher spire than the recent *N. canrena* (Linné). Numerous tangential plicæ start from the suture line and usually become faint or disappear before they reach the middle of the body whorl. The aperture is broadly elongate, narrower at the top. The callus on the inner lip is continuous with the umbilical callus; the umbilicus is partly filled at the base, leaving a rather deep, comma-shaped depression.

This form differs from the recent *N. canrena* in its smaller size, higher spire and more sloping shoulders.

Age: Oligocene-Miocene.

Locality: District of Buchivacoa, State of Falcón; District of Miranda, State of Zulia; locality numbers 6, 25, 1140.

Genus **POLINICES** Montfort**Polinices subclausa** (Sowerby)

Pl. 36, fig. 5.

Natica subclausa Sowerby, 1849, Quart. Journ. Geol. Soc. London, vol. 6, p. 51.

Natica subclausa Sowerby, Guppy, 1866, Quart. Journ. Geol. Soc. London, vol. 22, p. 290, pl. 18, fig. 8.

Polinices subclausa (Sowerby), Brown and Pilsbry, 1911, Proc. Acad. Nat. Sci. of Philadelphia, vol. 63, p. 360.

Polinices subclausa (Sowerby), Maury, 1917, Bull. Amer. Pal., vol. 5, p. 300, pl. 49, fig. 14.

Polinices subclausa (Sowerby), Olsson, 1922, Bull. Amer. Pal., vol. 9, p. 329, pl. 16, figs. 16, 17.

Our specimens from Bowden, Jamaica, are usually larger than the Costa Rican forms and are about the same size or slightly smaller than those from Santo Domingo.

Age: Miocene.

Locality: Bowden Hill, Bowden, Morant Bay, Jamaica.

Polinices subclausa lavelana F. Hodson, n. subsp.

Pl. 36, fig. 8; pl. 37, figs. 12, 14.

This subspecies differs in having a pronounced umbilical notch in the callus on the inner lip just posterior to the spiral umbilical rib. The depth of this notch is variable. The callus on the upper half of the inner lip may have a straight margin at its distal contact or it may be slightly concave. The type from Venezuela is slightly weathered, and shows a rather concave margin at the contact of the callus of the inner lip with the preceding whorl; the characteristic, transverse groove at the top of the umbilical opening is present, but is not as distinct as it would appear in unweathered specimens. The Venezuelan form usually has a slightly heavier shell than the Bowden form, and tends to show a greater subsutural depression.

Age: Miocene.

Locality: Bowden, Jamaica; Districts of Colina and Democracia, State of Falcón, locality numbers 86, 93 (?), 154, 178, 185, 1033.

Polinices subporcana (Williston MS.), n. sp.

Pl. 36, fig. 3; pl. 37, figs. 5, 9, 16.

Williston's manuscript description is as follows:

"Our species is very close to *Polynices porcana* Spieker from the Zorritos formation of Peru, in size, shape, and general characteristics of the umbilical callus, but differs uniformly in having a small umbilical chink and a narrow v-shaped trough impressed in the callus near the lower margin of the peristome. The shell is large, low spired with a broad apical angle. Whorls about five, rounded and smooth except for growth lines. Sutures distinct but not channeled; base rounded."

The shell is thick and almost globular. One large specimen measures 47 mm. in height and another 60 mm. across greatest diameter of base. The bulbous, umbilical callus usually has a small semicircular area, delimited by a pronounced groove, near the aperture at the base of the body whorl.

Age: Miocene.

Locality: Districts of Democracia, Miranda and Colina, State of Falcón, locality numbers 70A, 70B, 70C, 72, 81, 82, 83, 83B, 85, 86, 87, 96, 97, 169A (?), 185, 225 (?), 1017, 1233, 1552, 1862, 1866, 1872, 1877, 1892, 1905, 1908 (*cf.*).

Polinices stanislas-meunieri venezuelana F. Hodson, n. subsp.

Pl. 37, figs. 10, 15.

This subspecies is rather abundant and although it sometimes grades into *P. stanislas-meunieri* Maury,¹ it usually is smaller. Typically, our subspecies, in addition to being smaller, has an umbilical notch more or less pronounced near the upper part of the lower half of the inner lip. The umbilical callus on the inner lip tends to be heavier below the umbilical notch and reduces the size of the umbilicus to a greater extent than in the species, *sensu stricto*. There is a slight, subsutural depression in both

¹ Bull. Amer. Pal., 1917, vol. 5, pp. 300-301, pi. 49, figs. 15, 16.

the species and subspecies.

Age: Miocene.

Locality: Districts of Democracia, Miranda and Colina, State of Falcón, locality numbers 70A, 86, 185, 187, 1033, 1233, 1255.

Polinices (Neverita) paraguensis F. Hodson, n. sp.

Pl. 38, figs. 2, 3, 4.

Shell low-spired, polished, of moderate size, having 5 or 6 whorls. Each later whorl almost covers the preceding one. The curved growth lines are retractive from the upper suture to the umbilical callus. The growth lines are crossed by faint, close-set spirals which are about parallel to the upper sutural line. The upper half of the whorl is flattened but slightly arched; the flattening or rotundity of the upper part of the whorl is probably a secondary sexual character. The umbilicus is completely filled with callus.

Age: Miocene-Pliocene.

Locality: District of Falcón, State of Falcón, locality numbers 1073, 2207.

Polinices paraguensis quirosana F. Hodson, n. subsp.

Pl. 38, figs. 1, 5, 7.

This subspecies differs principally in the umbilical callus which does not completely fill the umbilicus, but leaves a small chink or unfilled area. The upper half of the last whorl is more rotund or convex than in the species, *sensu stricto*.

Age: Oligocene-Miocene.

Locality: District of Miranda, State of Zulia, locality number 6.

Polinices paraguensis buchivacoana F. Hodson, n. subsp.

Pl. 38, figs. 6, 9.

This subspecies is distinguished by its much smaller size and larger umbilical callus. The filling is bulbous and extends below the base of the shell; this bulbous callus com-

pletely fills the umbilicus, but frequently leaves a lunar or crescent-shaped groove between the callus and the body whorl. The upper part of the whorl is somewhat flattened. The spiral lines are very indistinct. The figured specimens of the subspecies represent the largest ones found. They are commonly smaller and more or less fragmentary.

Age: Oligocene.

Locality: District of Buchivacoa, State of Falcón, locality numbers 1139, 1215, 1217.

Genus AMPULLINA (Lamarck) Bowdich

***Ampullina* (?) *santiagana* F. Hodson, n. sp.**

Pl. 38, fig. 8; pl. 39, figs. 1, 2.

Shell large with rapidly expanding whorls and a moderately high spire. There are 4 or 5 whorls, the sides of which have a rather uniform slope with small shoulders noticeable at the top of each whorl just below the suture line. The base of the shell is almost flat, and a large callus completely covers the umbilicus.

Unfortunately, the shell matter in our specimens is frequently weathered or recrystallized. The aperture is not well preserved in these large forms, which frequently measure 3 or 4 inches across the flat base. In the casts, there is a pronounced shoulder at the top of each whorl.

Ampullina amphora (Heilprin)¹ is a large form which has pronounced shoulders at the top of each whorl and the umbilicus only partly filled with callus.

Age: Oligocene.

Locality: Districts of Buchivacoa and Petit, State of Falcón, locality numbers 33 (variation), 59, 256 (*cf.*), 1036, 1037 (*cf.*), 2005.

Family VERMICULARIIDÆ Dall

Genus PETALOCONCHUS Lea

***Petalconchus sculpturatus domingensis* Sowerby** Pl. 38, fig. 10.

Petalconchus domingensis Sowerby, 1849, Quart. Journ. Geol. Soc.

¹ Explorations in Florida, 1887, p. 112, fig. 50.

- London, vol. 6, p. 51, pl. 10, figs. 9a, b, c.
Vermetus (Petalococonchus) sculpturatus (H. C. Lea), Dall, (*partim*), 1892, Trans. Wagner Free Inst. Sci. of Philadelphia, vol. 3, p. 305.
Petalococonchus domingensis Sowerby, Brown and Pilsbry, 1911, Proc. Acad. Nat. Sci. Philadelphia, vol. 63, p. 359.
Petalococonchus domingensis Sowerby, Maury, 1917, Bull. Amer. Pal., vol. 5, no. 29, p. 128, pl. 22, fig. 11.
Petalococonchus domingensis Sowerby, Hubbard, 1921, Sci. Surv. Porto Rico and Virgin Islands, N. Y. Acad. of Sci., vol. 3, (1920), pt. 2, p. 139.
Petalococonchus sculpturatus H. C. Lea, Olsson, 1922, Bull. Amer. Pal., vol. 9, no. 39, pp. 146-147, pl. 14, figs. 10, 15.
Vermetus (Petalococonchus) domingensis (Sowerby), Pilsbry, 1921, Proc. Acad. Nat. Sci. of Philadelphia, vol. 73 (1921), p. 377.
Petalococonchus sculpturatus domingensis Sowerby, Maury, 1925, Bull. Amer. Pal., vol. 10, pp. 378-379, pl. 52, figs. 2, 4, 7.

Most of the numerous specimens in Venezuela have flat sides like those from Trinidad, Santo Domingo and Costa Rica; some are rounded. A comparison has not yet been made with specimens of *P. sculpturatus* H. C. Lea from the Chesapeake Miocene, and later when this comparison is made, it may be necessary to put this variety in synonymy with the older species.

Age: Miocene.

Locality: Districts of Democracia, Colina, Miranda, Falcón and Buchivacoa, State of Falcón, locality numbers 70A, 74, 82, 100, 103, 118, 120B, 121, 122A, 131, 149B, 154, 178, 180, 184, 185, 189, 204, 273, 283, 298, 299, 307, 1007, 1033, 1034, 1043, 1066, 1072, 1818, 1856, 1931C.

Family MARGINELLIDÆ Jousseaume

Genus MARGINELLA Lamarck

Marginella saladillensis F. Hodson, n. sp. Pl. 37, figs. 6, 7.

Shell is small, thin, smooth, and has a tapering spire. The outer lip is sharp, arcuate, but not denticulate. The inner lips bears 4 oblique, columellar plicæ; the anterior of these forms the twisted base of the pillar; the plicæ are subequally spaced, the two anterior folds being a little closer together than the others and a little more oblique. There is no marked columellar callosity. The aperture is

much wider anteriorly; the anterior canal is wide and well defined; the posterior sinus is inconspicuous and is not notched. The spire has a nearly uniform taper which is almost constant for the upper half of the shell. The number of whorls in the spire could not be determined because a thin coat of enamel covers the sutures as well as all the whorls.

This species has about the same contour as *M. impagina* Dall from the Tampa Silex beds, but our form is larger and the outer lip is not elevated posteriorly.

Age: Oligocene-Miocene.

Locality: District of Miranda, State of Zulia, locality numbers 6, 1140.

Marginella quirosensis F. Hodson, n. sp.

Pl. 37, figs. 3, 4, 8.

Shell is small, solid, and moderately convex. The spire and body whorls are covered with a coat of enamel, which somewhat obscures the nuclear whorls and sutures. The aperture is narrow but becomes wider anteriorly. The outer lip is thickened, especially toward the middle, and is protracted posteriorly on the preceding whorl. The posterior sinus is rounded, narrow, and very slightly reflexed. The columella is short and carries 4 prominent subequal folds, of which the anterior two are more oblique and closer together; the anterior of these oblique folds forms the lower, twisted edge of the columella. On the inner lip, behind the columellar folds, and more or less at right angles with them, is a longitudinal ridge covered by the columellar callus; the ridge is parallel to the inner margin of the outer lip and extends along the posterior two-fifths of the aperture. The inner lip is delimited from the body whorl by a slightly thickened, elevated callosity. The height of the spire is variable but the holotype represents the more common appearance.

This species is analogous to, and closely resembles, *M.*

elegantula Dall,¹ but does not carry the denticulation on the inner margin of the outer lip. There seems to be a slight difference in the spacing of the columellar plaits and a more prominent columellar callosity in our species.

Age: Oligocene-Miocene.

Locality: District of Miranda, State of Zulia; District of Buchivacoa, State of Falcón; locality numbers 6, 1140, 2040.

***Marginella quirosensis paraguanensis* F. Hodson, n. subsp.**

Pl. 37, figs. 1, 2.

This subspecies differs mainly in being much larger. The outer lip stands out a little more abruptly at the base of the spire than is common in the species, *sensu stricto*.

Age: Miocene.

Locality: District of Falcón, State of Falcón, locality number 2207.

***Marginella berjadinensis* F. Hodson, n. sp.**

Pl. 37, figs. 11, 13; pl. 40, figs. 16, 18.

Shell is small, solid, and moderately convex. The spire is short, blunt and covered with a coat of enamel which extends over the body whorl. The enamel somewhat conceals the sutures of the earlier whorls. The aperture is narrow, and widens a little anteriorly. The outer lip is thickened, somewhat arcuate, marginate, and marked with a longitudinal groove along the dorsal margin; the lip is terminated posteriorly rather abruptly; it becomes thinner adjacent to the aperture and is not denticulate. The posterior sinus is rather narrow. The columella carries 4 folds, the anterior two of which are more oblique and closer together; the anterior of these forms the lower edge of the columella.

This species differs from *M. quirosensis* (n. sp.) in having a much shorter spire and in lacking such a definite

¹ Trans. Wagner Free Inst. Sci. of Philadelphia, 1890, vol. 3, pt. 1, p. 54, pl. 4, fig. 7; and Bull. 90, U. S. Nat. Museum, 1915, p. 53, pl. 16, fig. 11.

longitudinal ridge along the upper part of the inner lip.

Age: Miocene.

Locality: District of Buchivacoa, State of Falcón, locality number 2391.

Marginella gatunensis colinensis F. Hodson, n. subsp.

Pl. 40, figs. 15, 17, 19.

This subspecies is very close to *M. gatunensis* Brown and Pilsbry¹ as described and figured. We have compared specimens from Gatun with our Venezuelan form. The main differences are in the shape of a transverse section of the shell, in the larger size of our subspecies and in the lack of internal denticulation on the outer lip of our form. The difference in the transverse section is due to the columnar callosity being produced on the side opposite the aperture. On the back of the shell at the termination of the heavy callus, there is a slight longitudinal depression, which is continuous with the depression or margination behind the thickened outer lip; hence, on the back of the shell, there is a more or less continuous groove running back of the callosity of the inner and outer lips. The Venezuelan form does not taper as rapidly anteriorly and the aperture tends to be slightly narrower.

Age: Miocene.

Locality: District of Colina, State of Falcón, locality numbers 121, 178 (?), 184, 185, 299, 1033, 1255.

Marginella democraciana F. Hodson, n. sp.

Pl. 40, fig. 20.

Shell large, heavy, widely ovate, narrower anteriorly. Outer lip is somewhat arcuate, thickened, with a margination behind it, but is not denticulate within. The inner lip shows a slight columellar callus and strong, subequally spaced, columellar plaits; the anterior plait forms the twisted base of the pillar; the two anterior plaits are slightly closer together and more oblique than the others. The aperture is constricted posteriorly, and the posterior

¹ Proc. Acad. Nat. Sci. of Philadelphia, 1911, p. 347, pl. 24, fig. 10.

sinus is well marked at the top of the lip. The spire is moderately high, tapers abruptly, and ends in a rather sharp apex; the spire is composed of 4 or 5 whorls; the sutures are hidden by the enamel, which coats, also, all the whorls.

This species resembles the recent form *M. cærulescens* Lamarck, which is very common along the north coast of Venezuela. It is distinguished from this recent species by its larger size, sharper spire, more arcuate outer lip, and by a more rapid taper of the shell anteriorly.

Age: Miocene.

Locality: District of Democracia, State of Falcón, locality number 70A.

Subgenus PERSICULA Schumacher

***Marginella (Persicula) venezuelana* F. Hodson, n. sp.**

Pl. 40, figs. 13, 14.

Shell small, broadly ovate, somewhat narrower anteriorly, enameled. Outer lip is rather thick, arcuate, internally denticulate, and only slightly marginate. The inner lip bears a fold bordering the anterior canal; near the anterior third of the inner lip, there is a strong, grooved, or double, columellar fold lying at about right angles with the axis of the shell; just behind the double plait or fold, there is a depression which is more or less marked; posterior to the double plait, there are 3 or 4 small, short, columellar folds, also lying at about right angles with the axis of the shell. The shell is rather thick and the spiral color bands are so concealed by enamel that it is not possible to count them except when the shell is weathered or partly digested with dilute acid, in which case there are about 22 narrow, spiral, color bands exposed.

This species is the direct forerunner of the subspecies *lavelana*, from which it differs principally in its smaller size.

Age: Oligocene-Miocene.

Locality: District of Miranda, State of Zulia, locality numbers 6, 1140.

***Marginella venezuelana lavelana* F. Hodson, n. subsp.**

Pl. 40, figs. 3, 10, 11.

This subspecies differs mainly in being much larger, more plump, and in having a more prominent longitudinal ridge on the upper part of the inner lip; this ridge is more or less parallel to the upper part of the aperture. This subspecies sometimes shows a slight margination behind the outer lip. The outer lip is thick, rounded, and somewhat hollowed out near the middle of its ventral edge so that its profile shows a slight central depression (as viewed laterally). There are more small, columellar folds behind the strong, grooved, anterior fold than in the species, *sensu stricto*.

Age: Miocene.

Locality: District of Colina, State of Falcón, locality numbers 184, 185, 1033, 1255.

***Marginella venezuelana falconensis* F. Hodson, n. subsp.**

Pl. 40, figs. 4, 5.

This subspecies is an outgrowth of the subspecies *lavelana*. It is more cylindrical and less inflated. The anterior and posterior sinuses are deeper and more pronounced. There are only about 3 small, posterior, columellar folds behind the strong, grooved, anterior fold.

Age: Miocene.

Locality: District of Falcón, State of Falcón, locality number 2207.

***Marginella (Persicula) maracaibensis* F. Hodson, n. sp.**

Pl. 40, figs. 1, 6.

Shell small, pyriform, enameled. Outer lip is sharp, arcuate, faintly denticulate, and without a margination. The inner lip carries a strong, oblique fold bordering the anterior canal, and a stronger, grooved or double columellar fold posterior to it. The double fold is almost at right angles to the direction of the aperture. Behind the double fold, there are about 5 equally spaced, smaller folds. The aperture is wider and paralleled by a longitudinal ridge on the upper half of the inner lip, which is covered by the columellar callus. The narrow, spiral color bands are perceptible but could not be counted.

This species resembles *M. (Persicula) mirandana* (n. sp.), but differs in having a wider aperture and a sharper outer lip, which is not wedge-shaped in cross section as it is in the former species.

Age: Oligocene-Miocene.

Locality: District of Miranda, State of Zulia, locality numbers 6, 1140.

***Marginella (Persicula) zuliana* F. Hodson, n. sp.**

Pl. 40, figs. 7, 12.

Shell is small, ovate, and slightly enameled. The outer lip is moderately thickened and internally denticulate. The inner lip carries two strong, anterior columellar folds, but there is a much slighter depression behind the second anterior fold than in *M. (Persicula) mirandana* (n. sp.). The second anterior fold is grooved and stronger than the more oblique basal one which limits the anterior canal. The columellar and body callus is present but is much thinner than in *M. (Persicula) mirandana*. On the upper half of the inner lip, there is a slight longitudinal ridge, which is about parallel to the outer lip. The aperture is wider than in *M. (Persicula) mirandana*. There are about 20 narrow, chestnut-colored, spiral bands, which are crossed by more closely spaced, incremental lines; on a well preserved specimen, this gives the shell a microscopically reticulate appearance.

This species is related to, and most closely resembles, *M. (Persicula) mirandana* (n. sp.), but it is longer, more slender, has a wider aperture, less prominent callosity and more spiral color bands.

Age: Oligocene-Miocene.

Locality: District of Acosta, State of Falcón; District of Miranda, State of Zulia; locality numbers 6, 1140, 1415.

***Marginella (Persicula) mirandana* F. Hodson, n. sp.**

Pl. 40, figs. 2, 8, 9.

Shell is small, enameled, pyriform, with a depressed

spire. The outer lip is thickened, but thins toward the aperture; it is denticulate internally. The inner lip carries two very strong, anterior, columellar folds; the first of these borders the anterior canal; the second is very strong, usually double or divided, and almost at right angles to the direction of the aperture. Behind the double columellar fold, there is a more or less marked depression. Posterior to this double plait, there are 3-5 smaller columellar folds. On the upper part of the inner lip, there is a pronounced longitudinal ridge covered with callus; this ridge is about parallel to the inner margin of the outer lip and varies in length from two-fifths to more than half of the length of the aperture. The columellar callus grades into the thick coat of enamel which covers the entire shell and more or less conceals the narrow, chestnut-colored, spiral bands, about 16 or 17 in numbers; in weathered shells, these spiral color bands stand out as revolving ridges separated by wider, channeled interspaces.

This species is extremely variable as to length and shape of the shell, the width of the aperture, the amount and nature of the thickening of the outer lip, as well as in the amount of depression found behind the double anterior columellar fold. It is somewhat smaller and more pyriform than *M. (Persicula) cercadensis* Maury,¹ which has a wider aperture and lacks the pronounced longitudinal ridge found in our species on the upper part of the inner lip.

Age: Oligocene-Miocene.

Locality: District of Miranda, State of Zulia, locality number 6.

Family TURRITELLIDÆ Gray

Genus TURRITELIA Lamarck

Turritella zuliana palmeræ F. Hodson

Turritella zuliana palmeri F. Hodson, 1926, Bull. Amer. Pal., vol. 11, pp. 179-180, pl. 6, figs. 1, 4.

A correction is noted here for the wrong ending inadvertently given to the name *palmeræ* in the original description.

¹ Bull. Amer. Pal., 1917, vol. 5, p. 237, pl. 37, fig. 9.

PLATE 1

Printed plates furnished for this publication by
F. and H. Hodson; photography by F. and H.
Hodson; engraving and printing by
L. Winkler & Co.

PLATE 1

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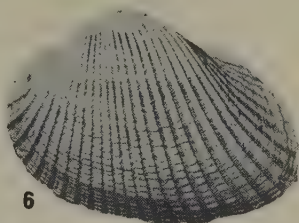
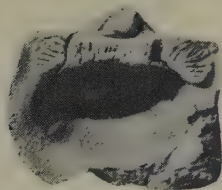
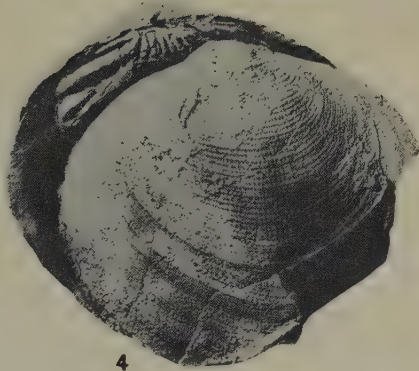
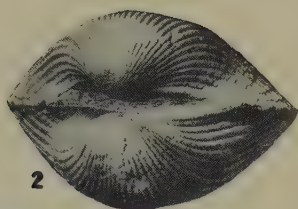
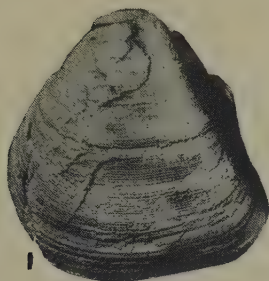


PLATE 2

PLATE 2

FIGURE	PAGE
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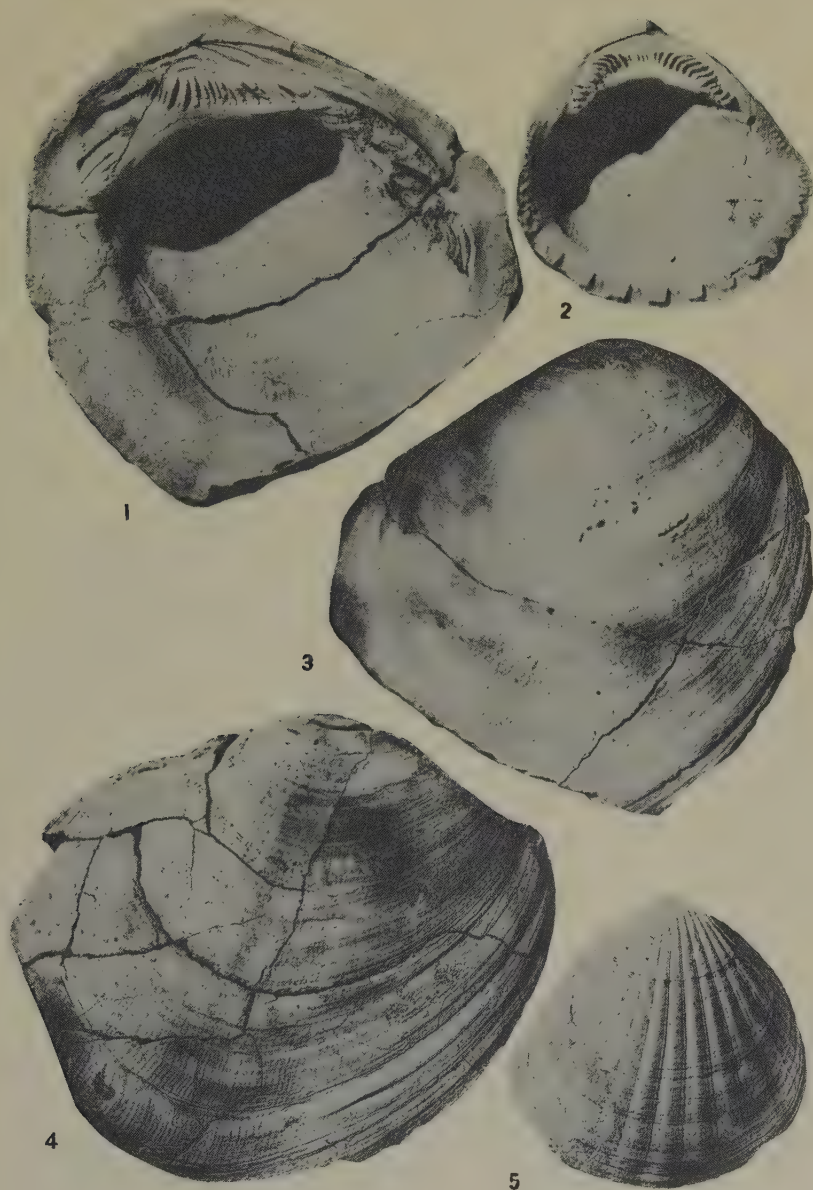


PLATE 3

FIGURE

PAGE

1. *Pseudocucullæa perijana* Harris, F. and H. Hodson, n. sp. Paratype from Loc. No. 2220; greatest length of fragment 60 mm. 1
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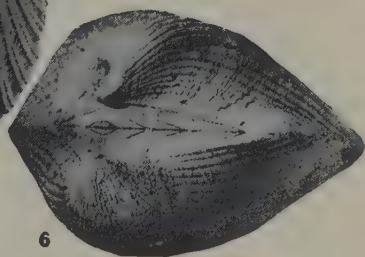
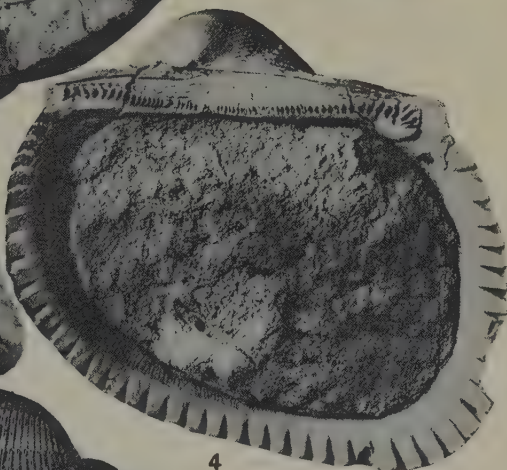
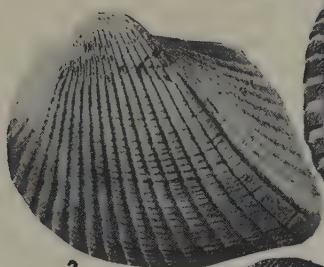
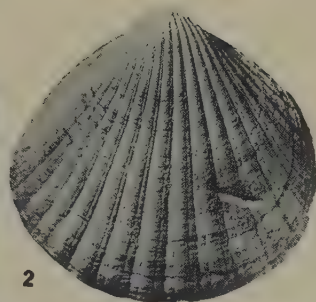
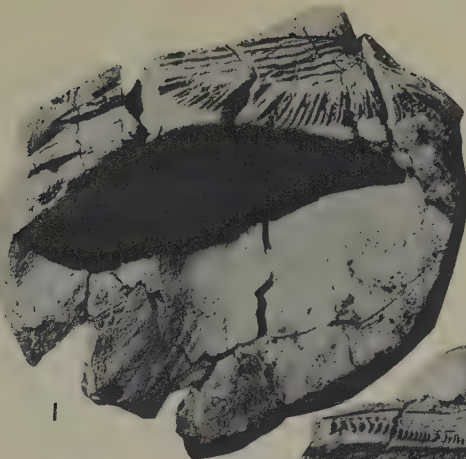


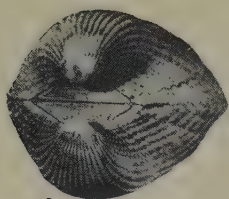
PLATE 4

PLATE 4

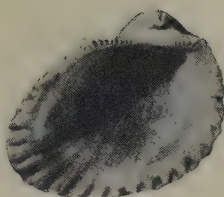
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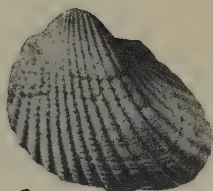
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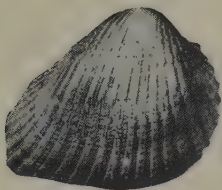
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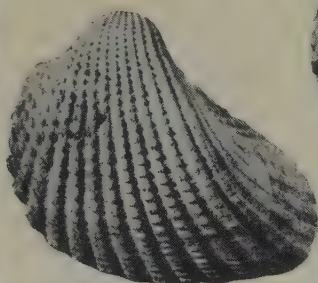
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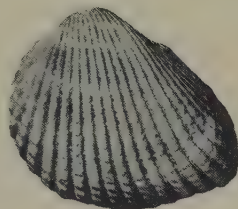
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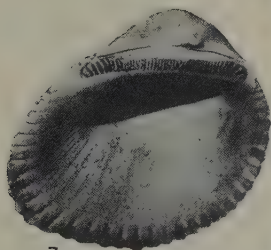
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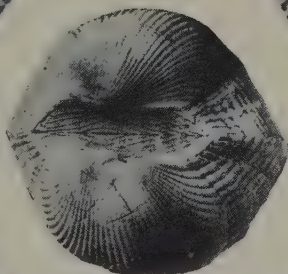
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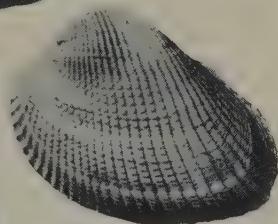
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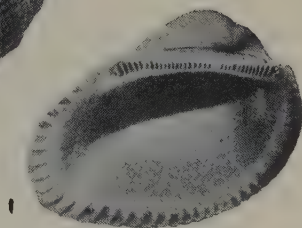
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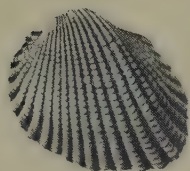


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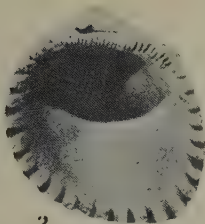
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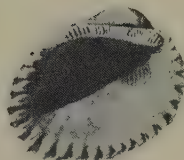
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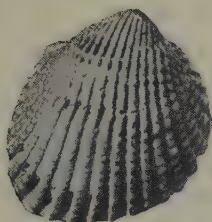
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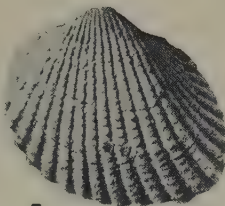
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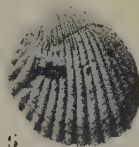
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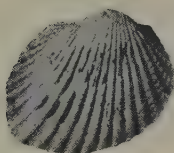
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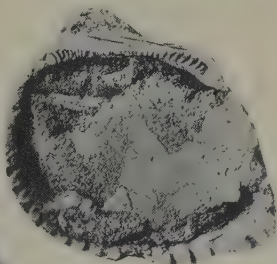
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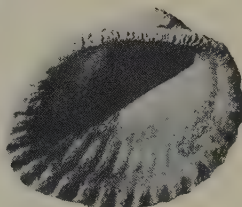
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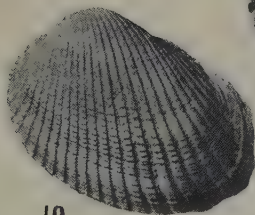
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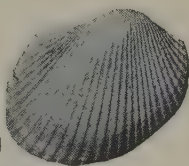
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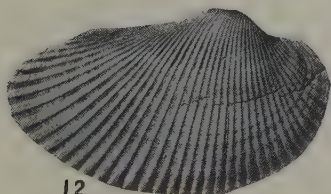
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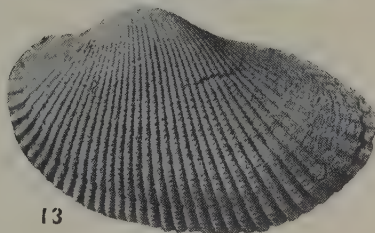
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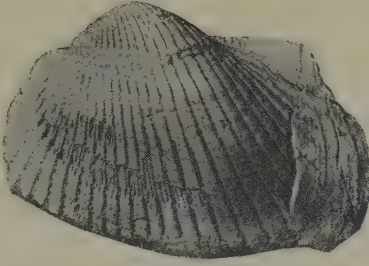


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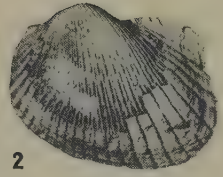
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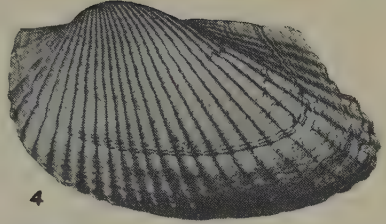
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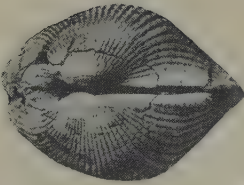
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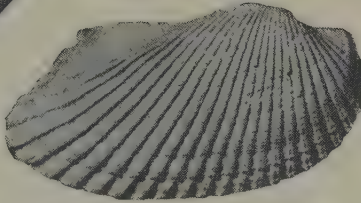
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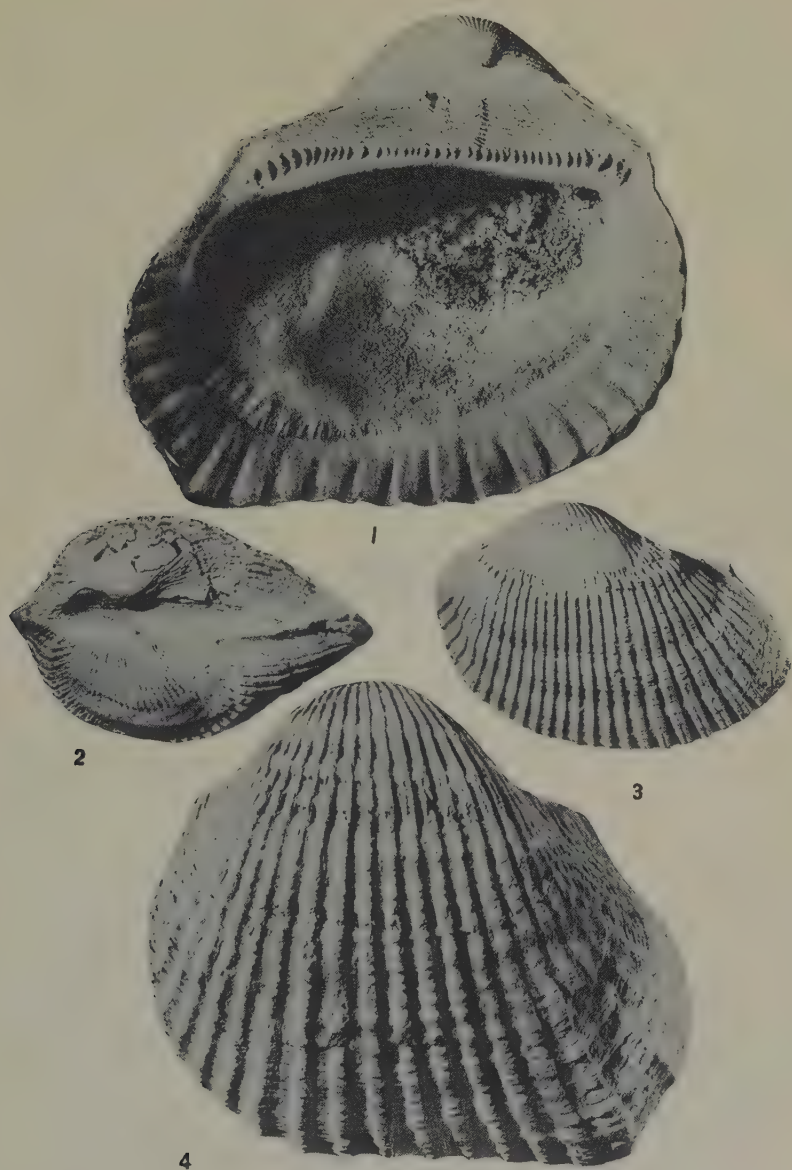


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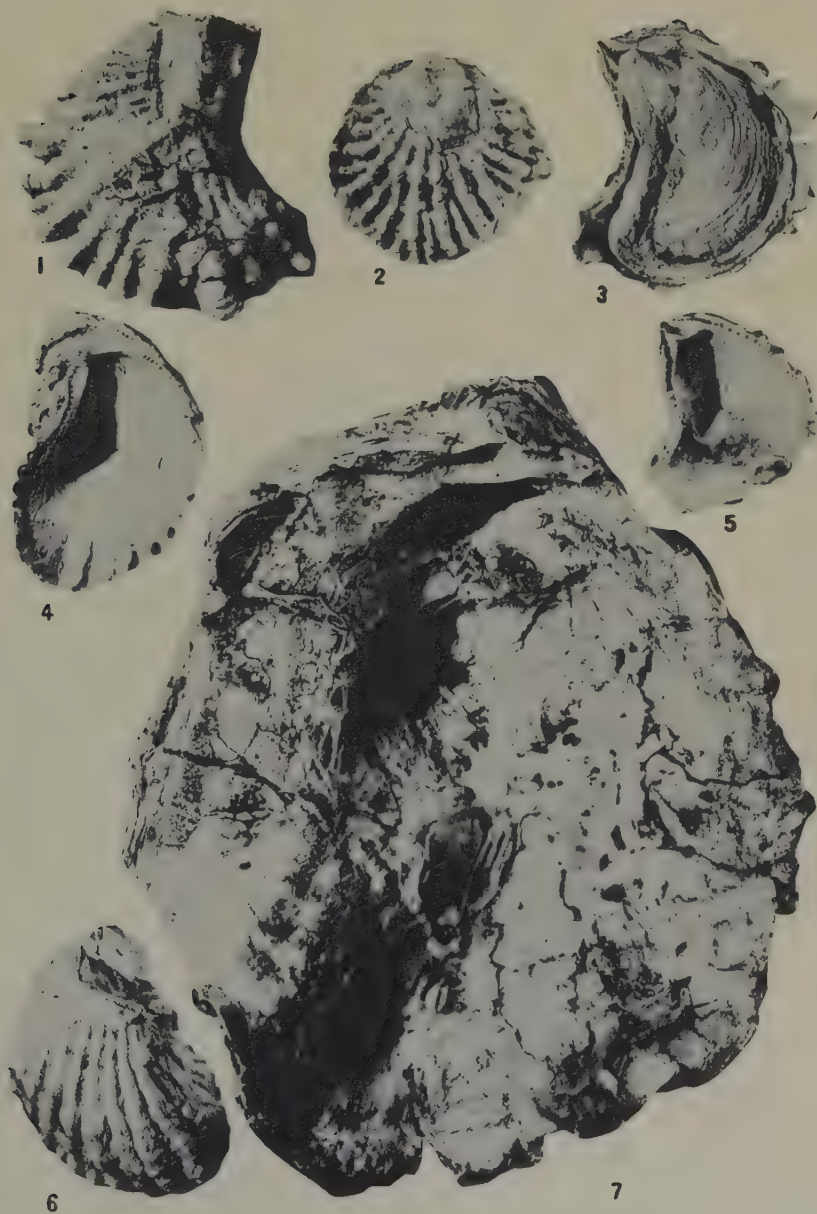
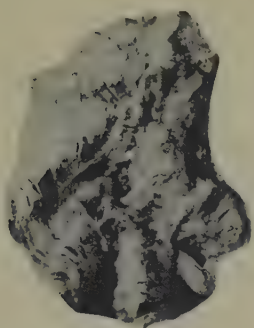


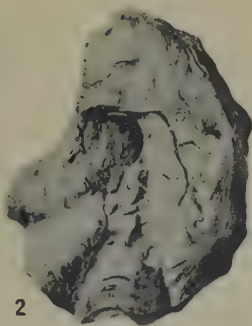
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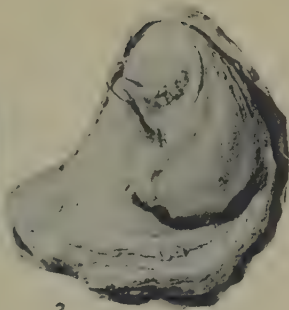
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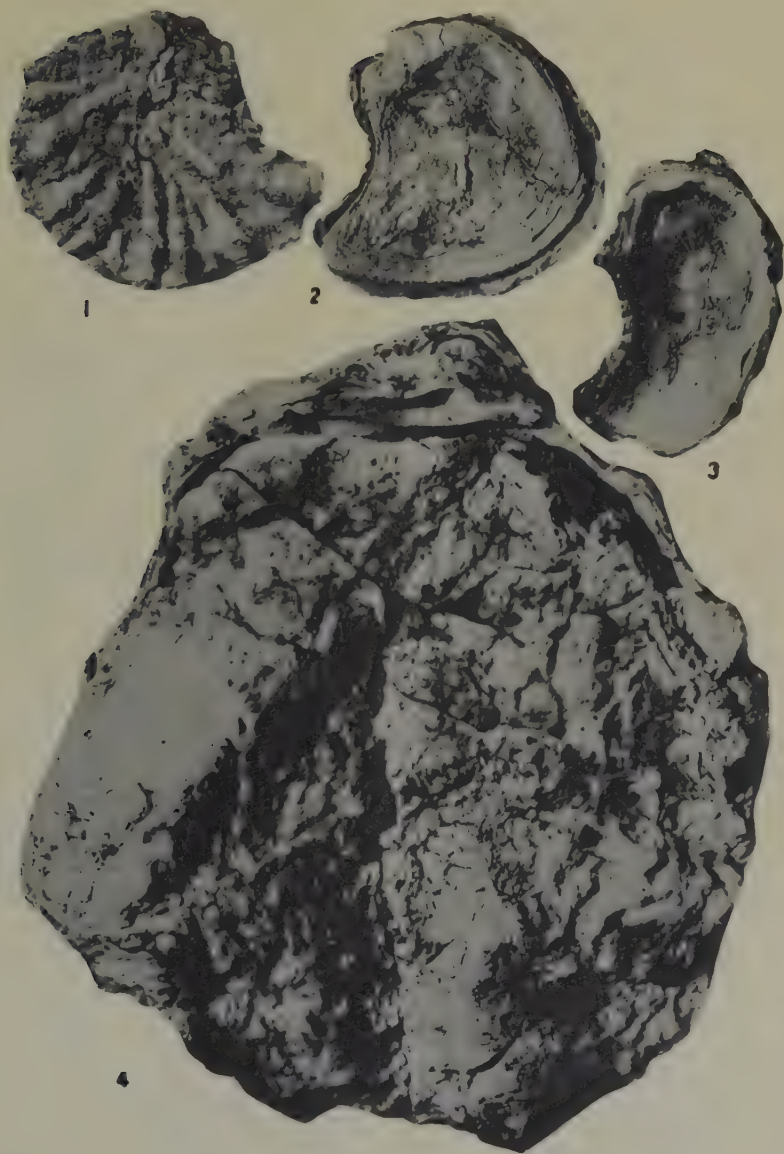


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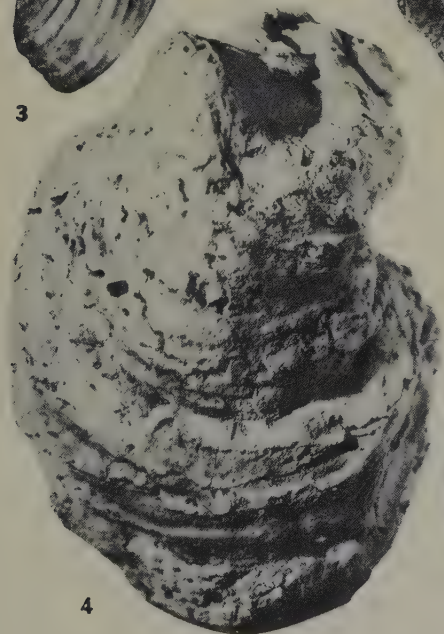
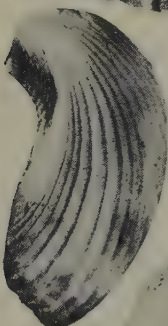
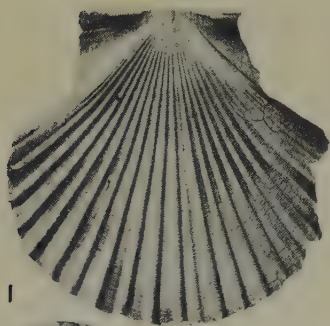


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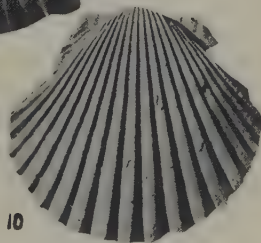
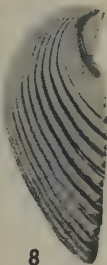
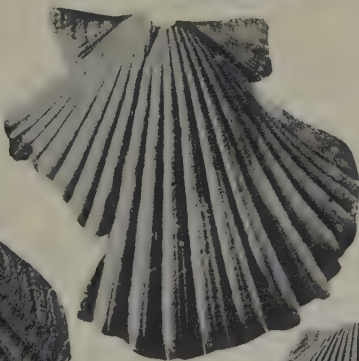
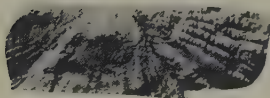
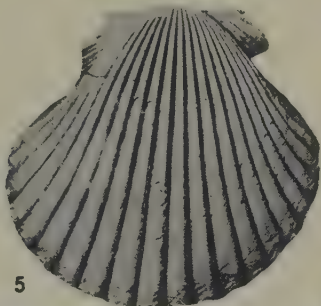
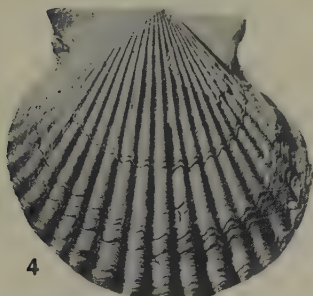
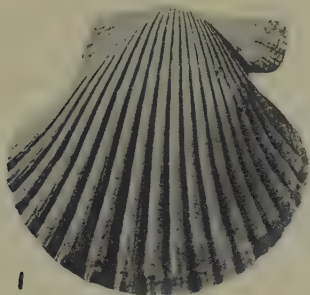
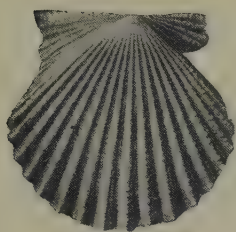


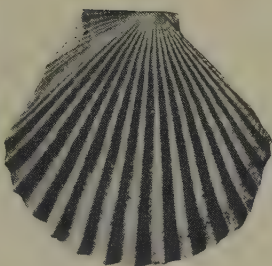
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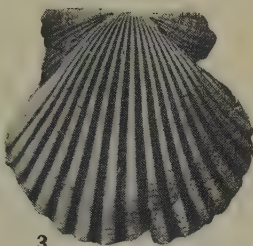
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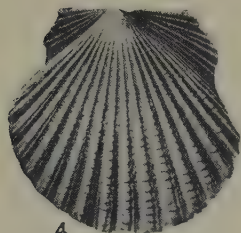
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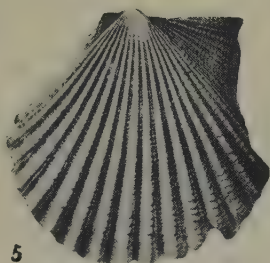
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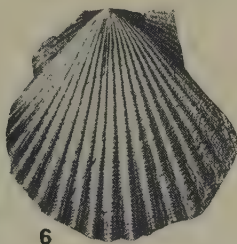
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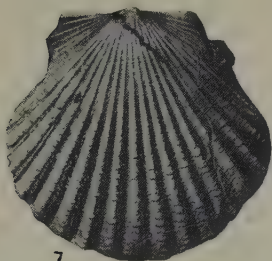
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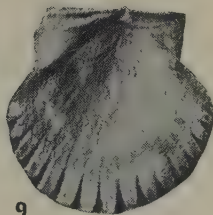
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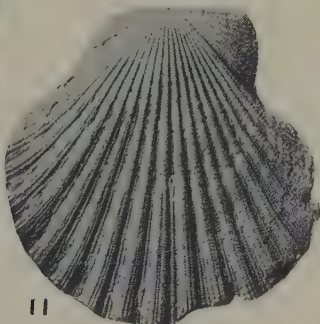
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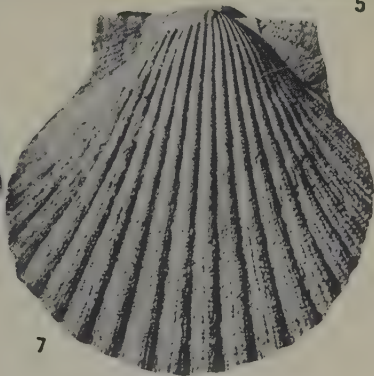
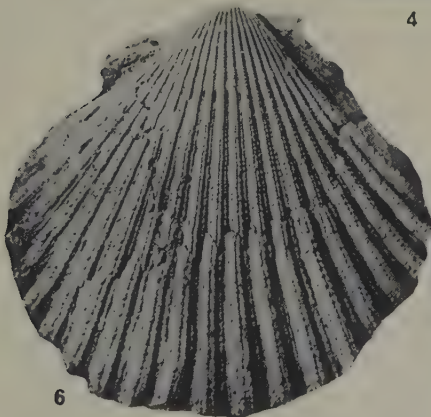
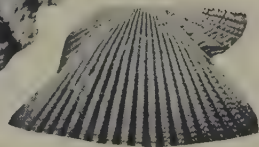
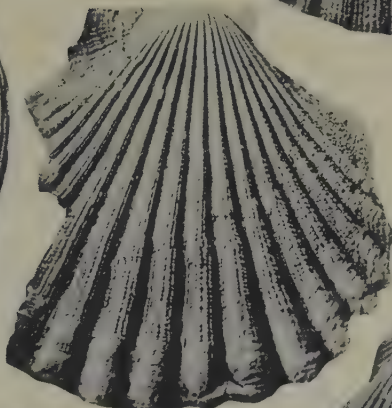
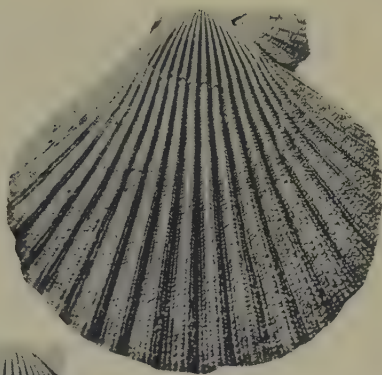
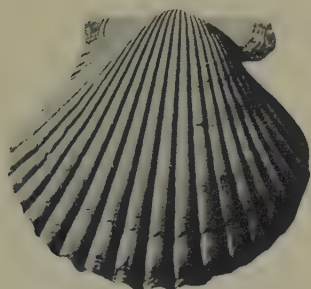


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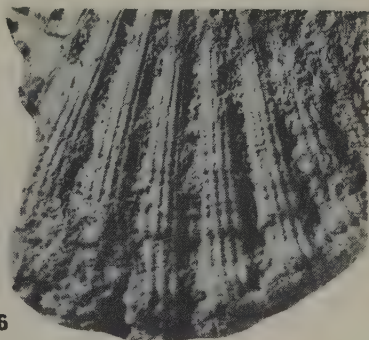
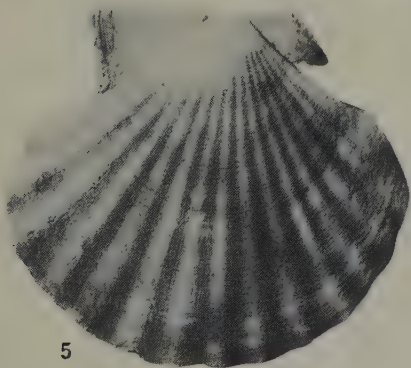
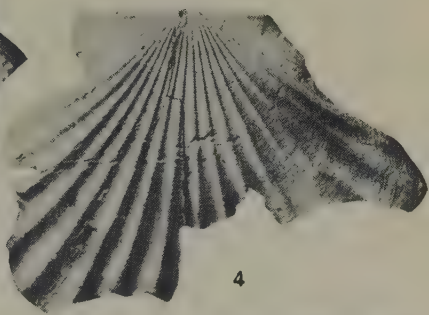
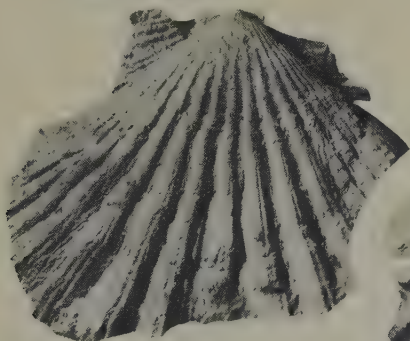
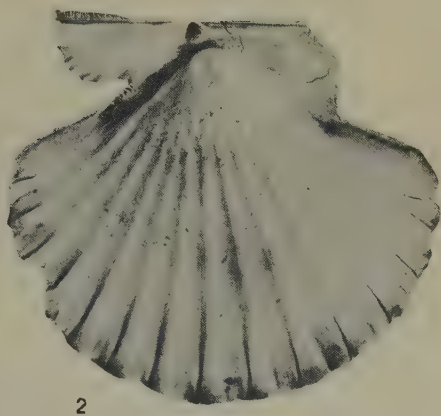
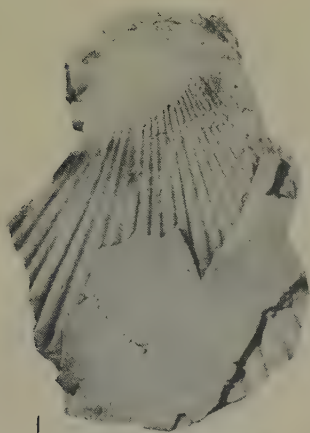


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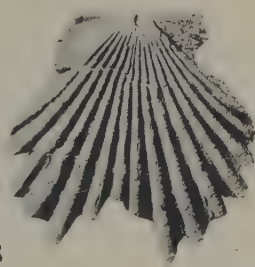
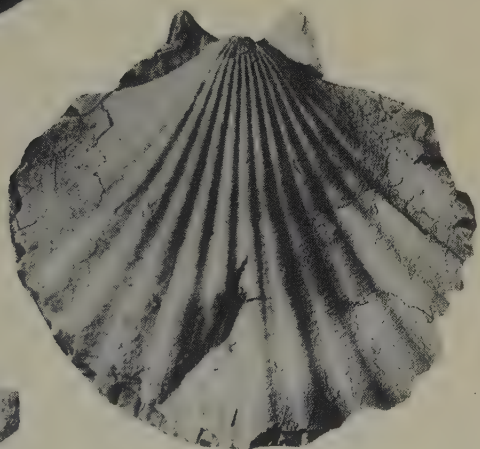
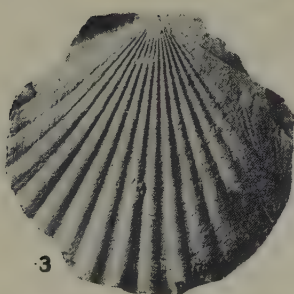
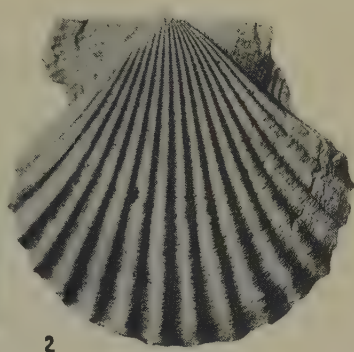
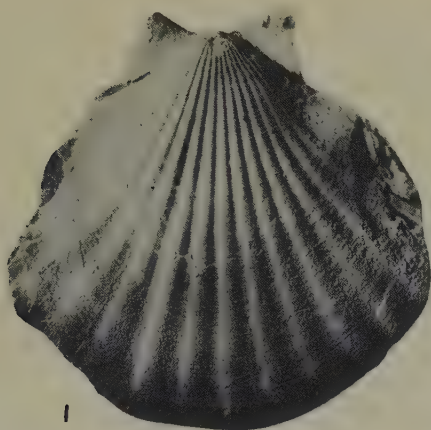


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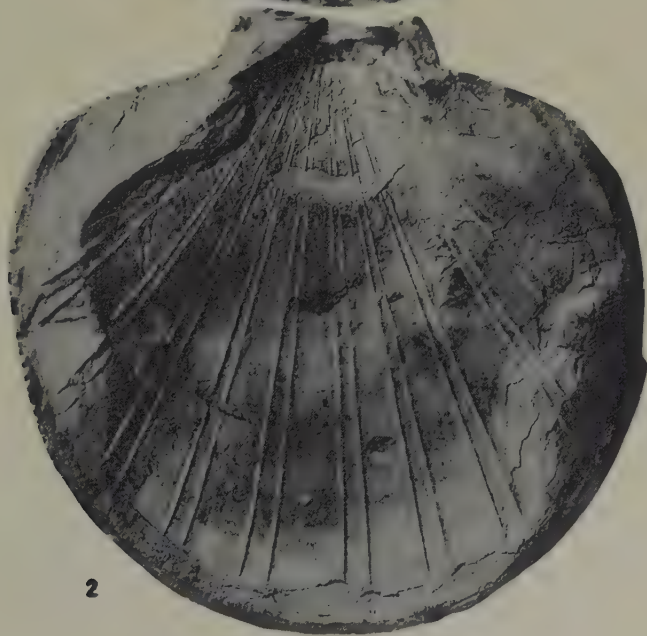
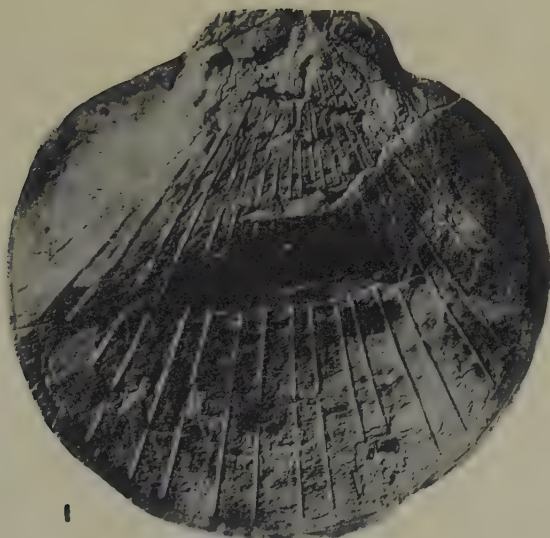


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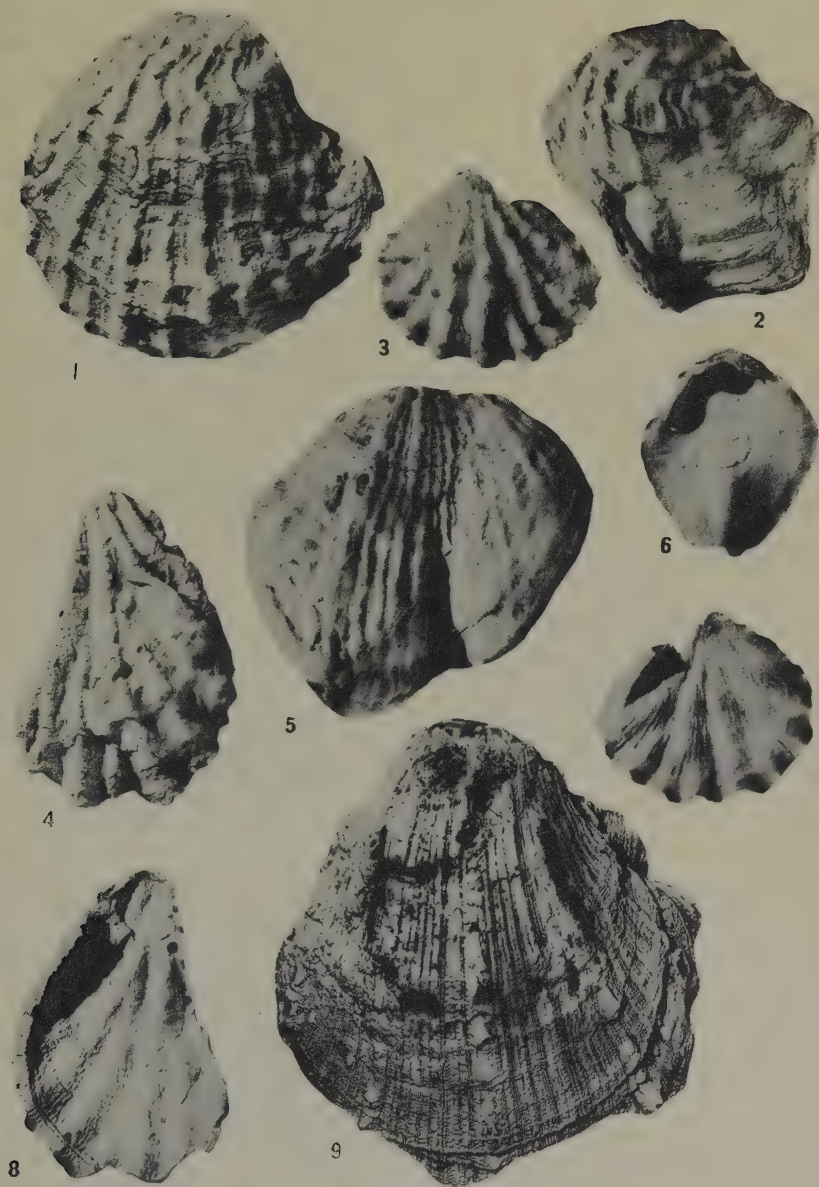
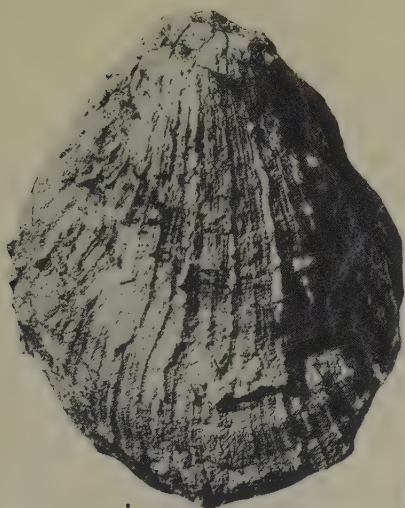


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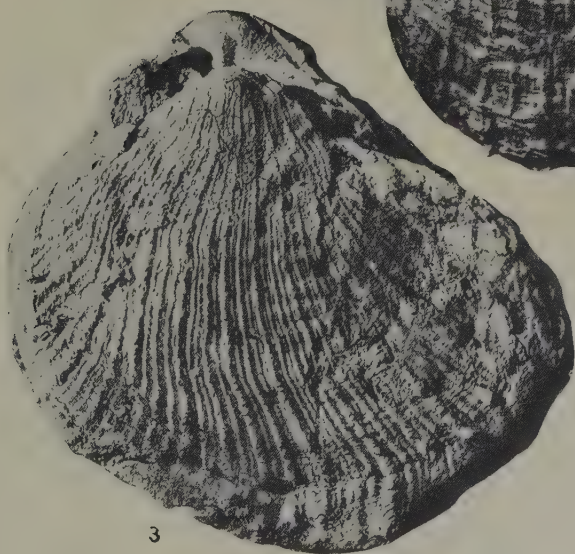
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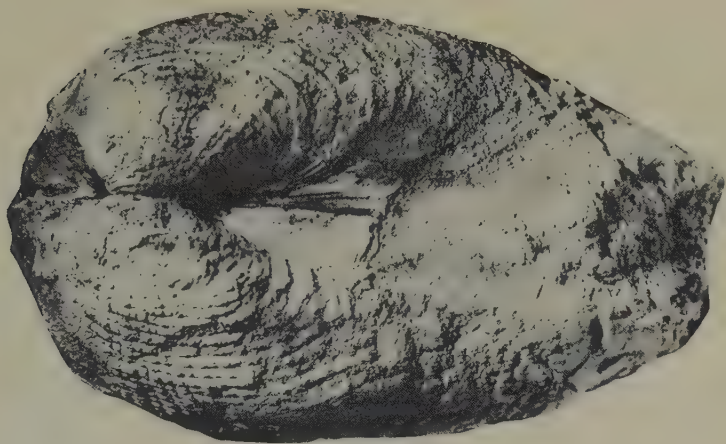
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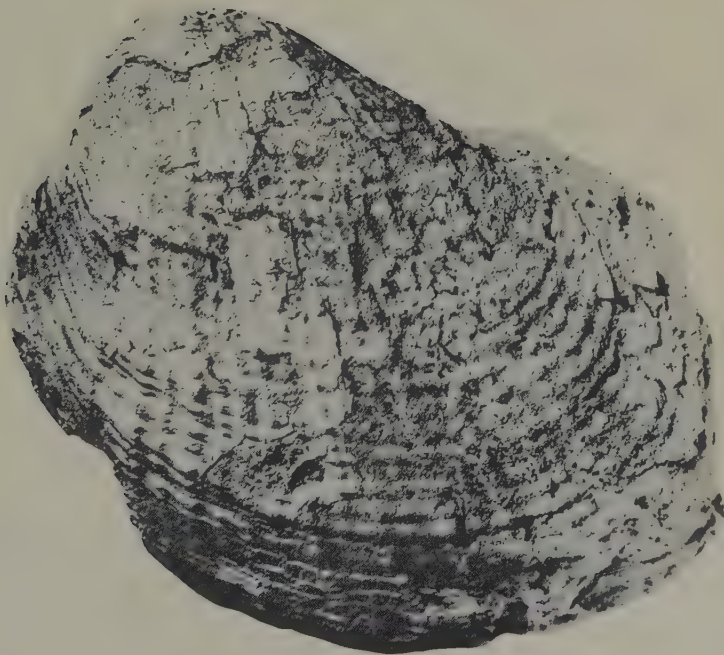
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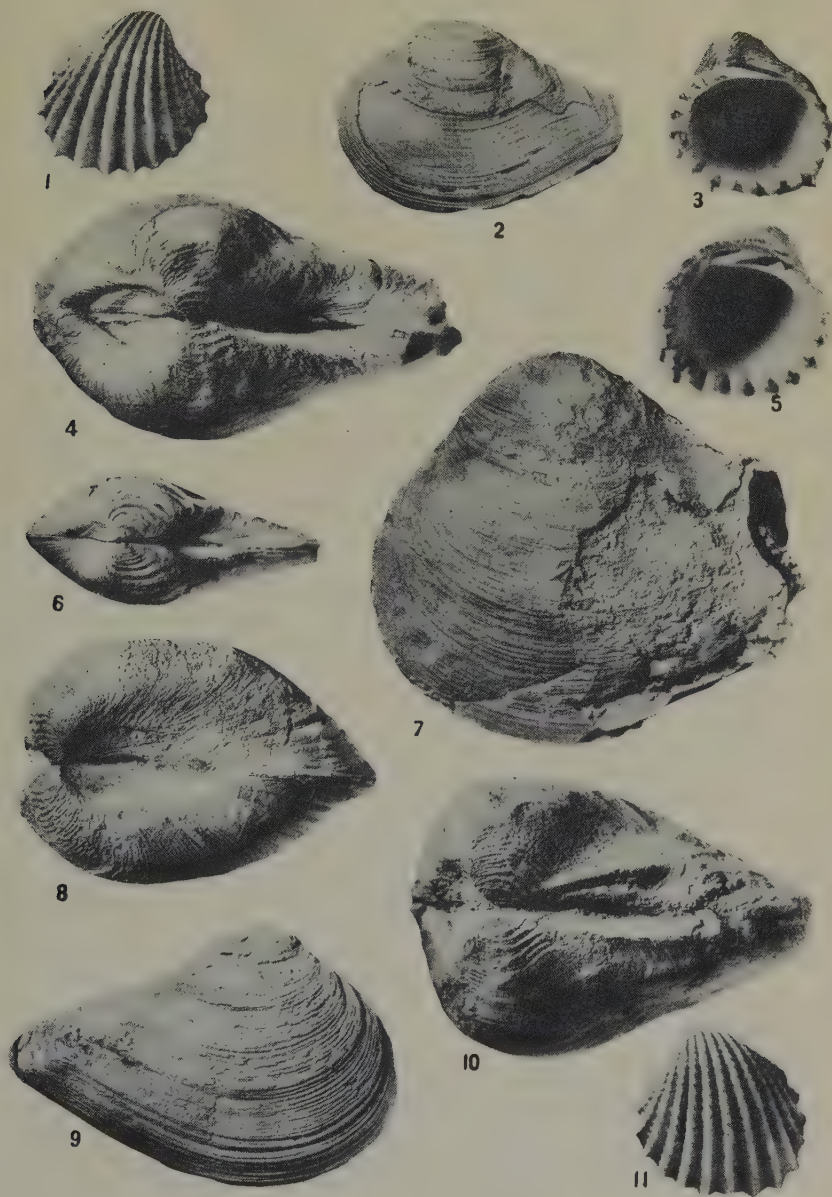


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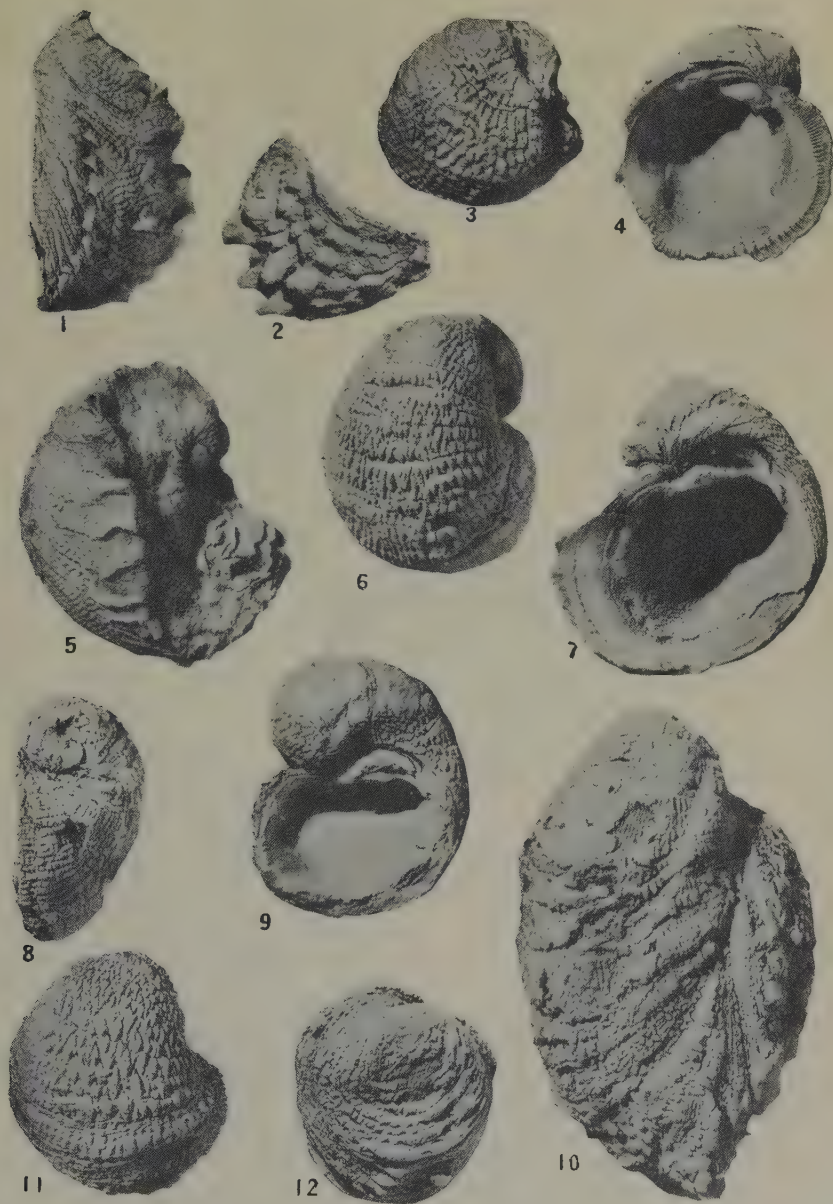


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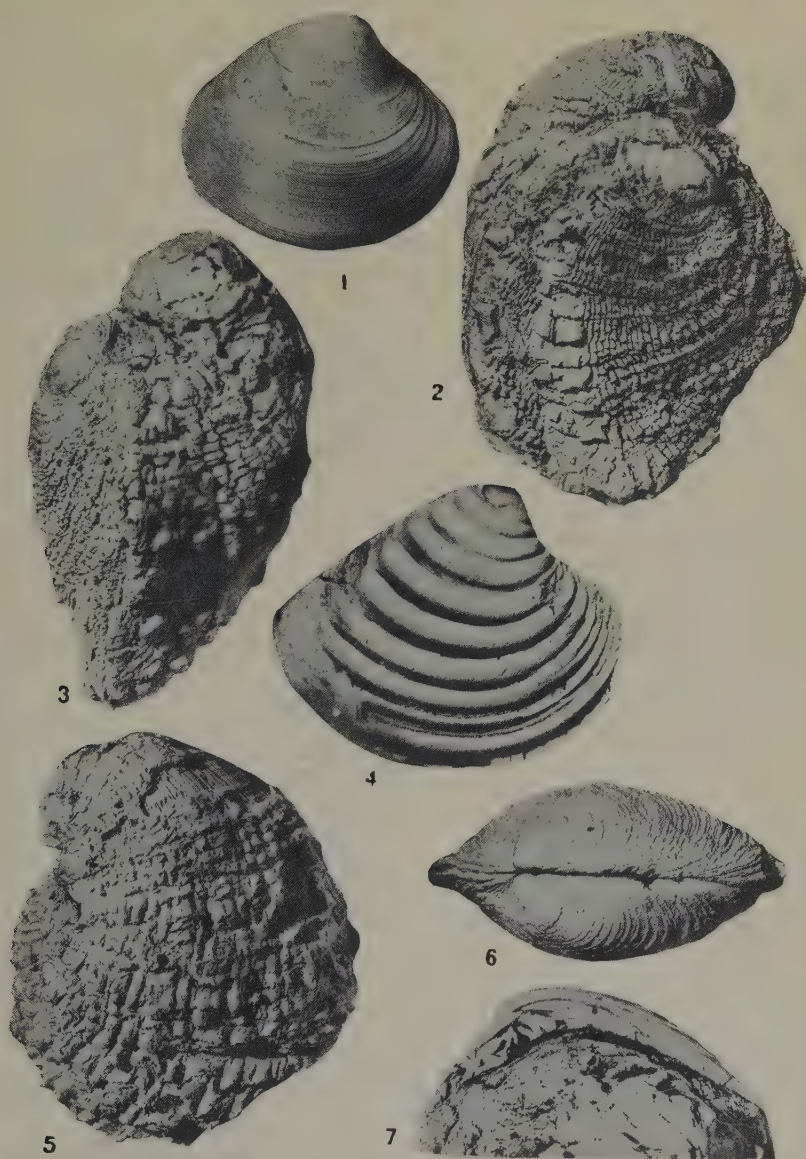
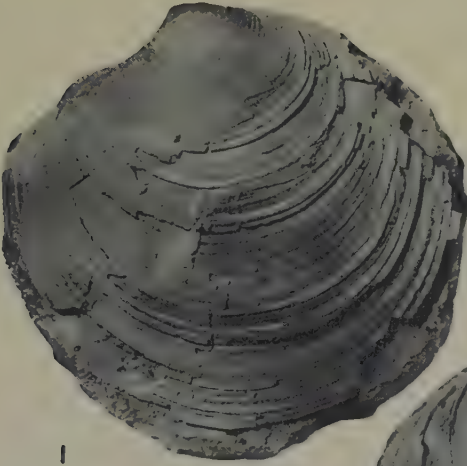


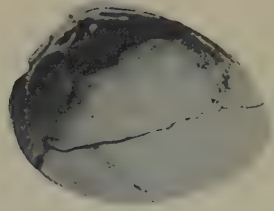
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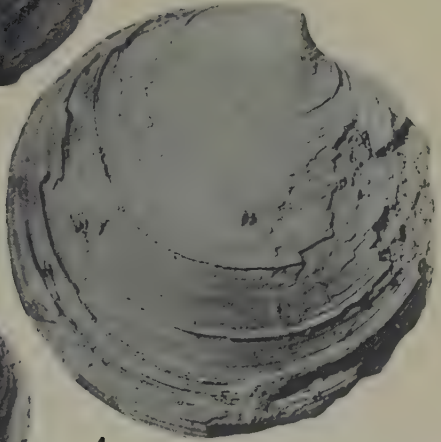
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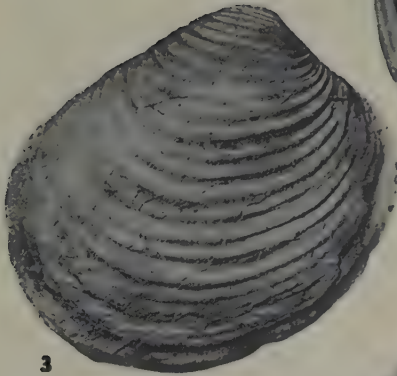
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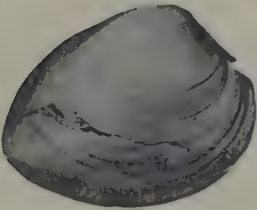
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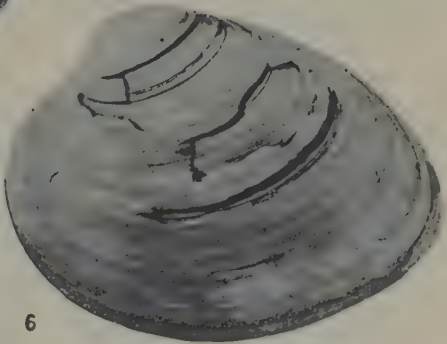
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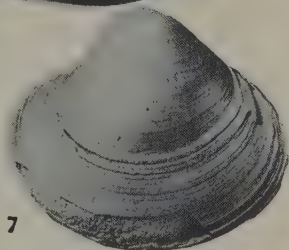
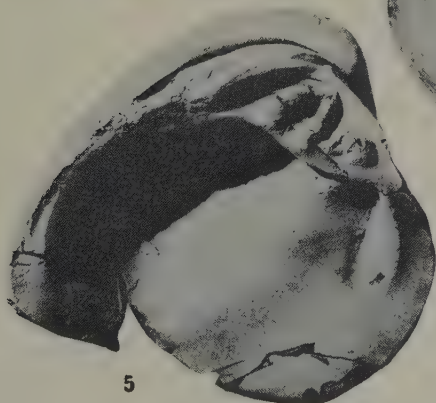
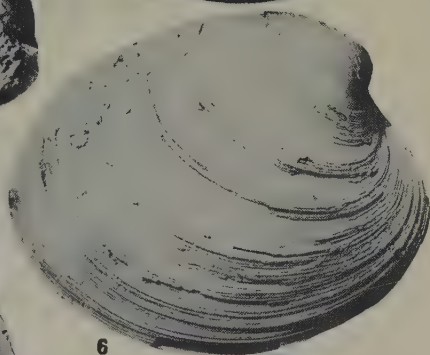
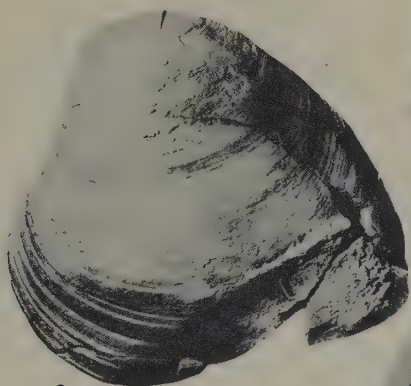
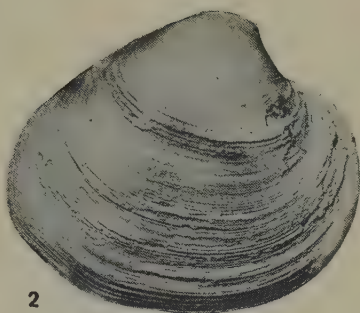
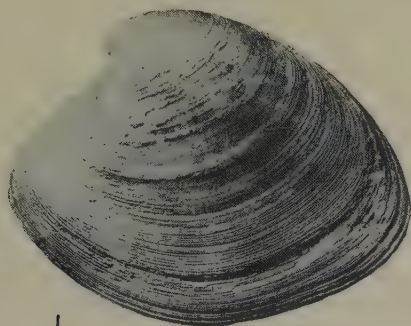


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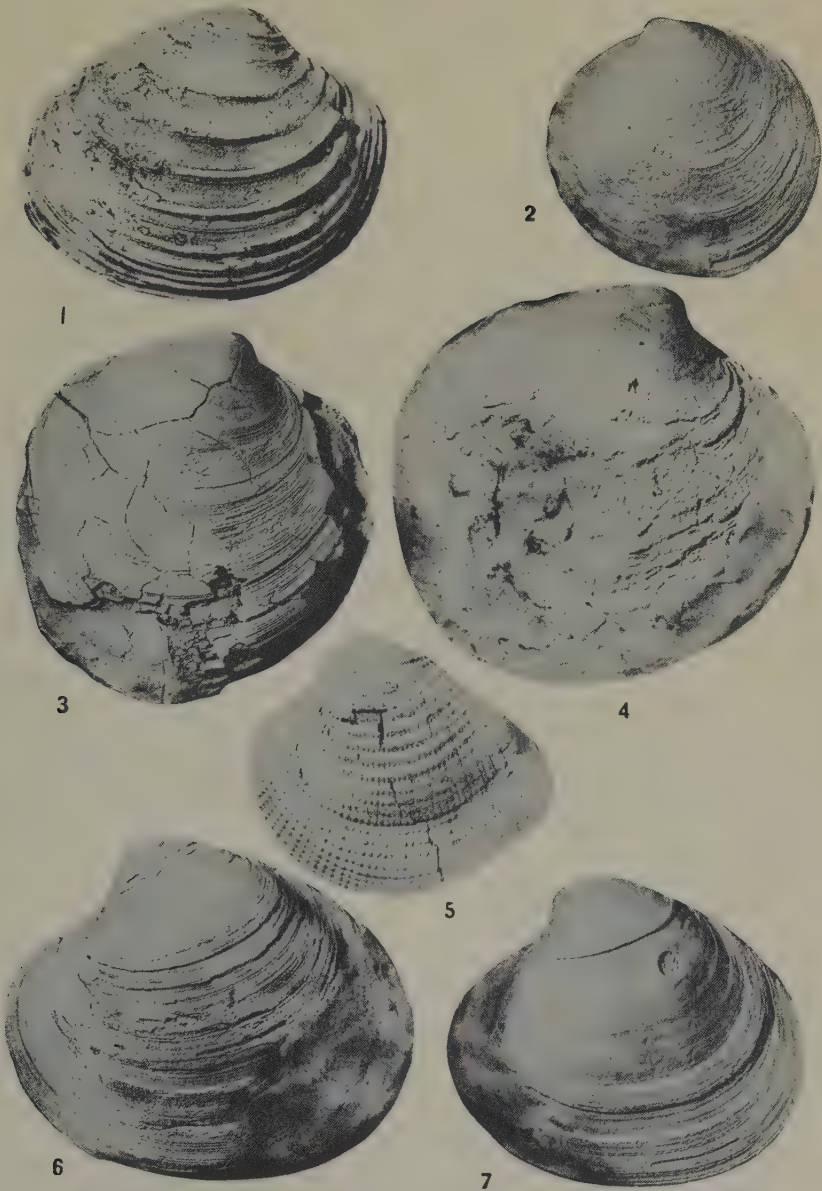


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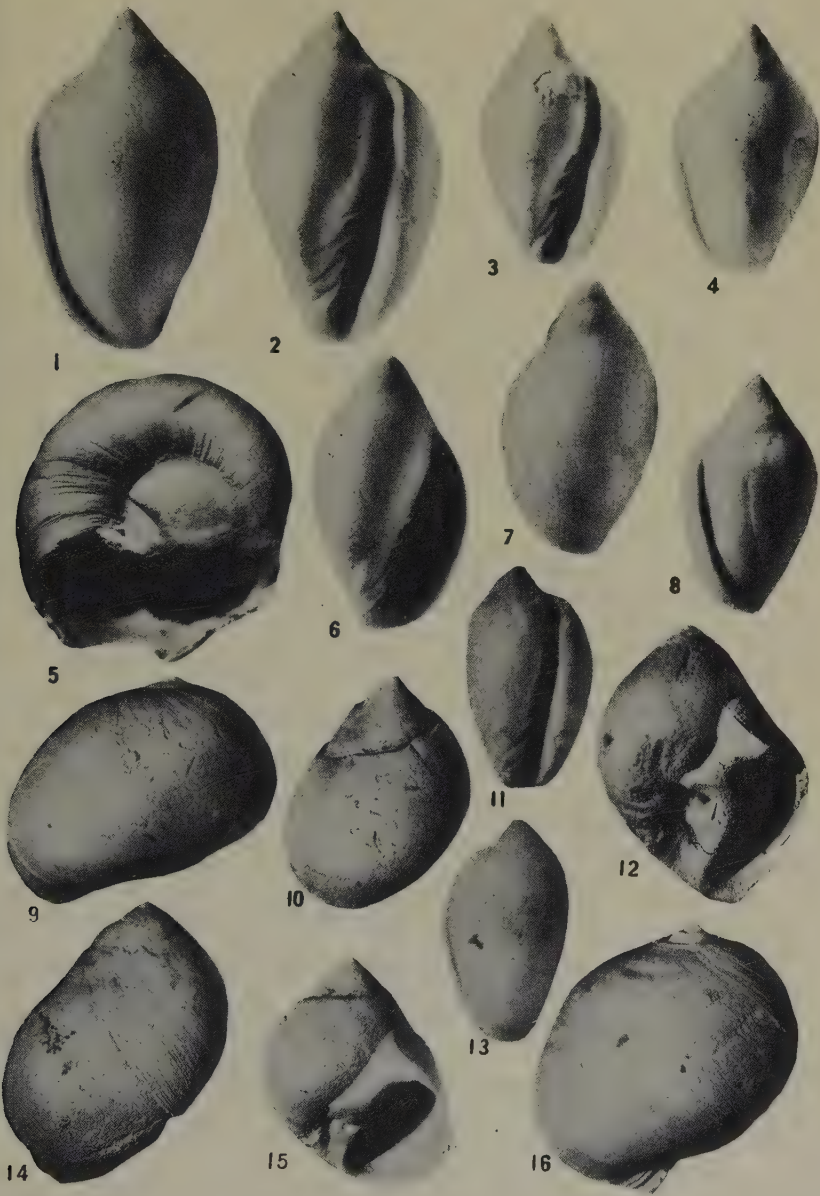
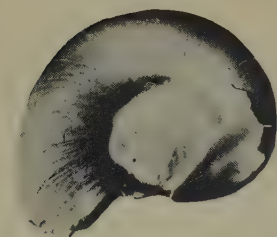


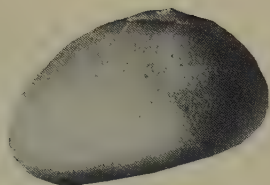
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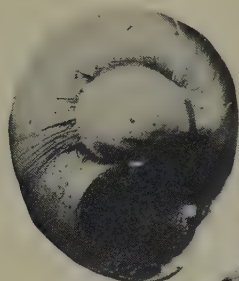
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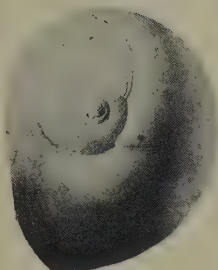
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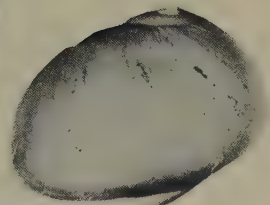
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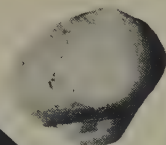
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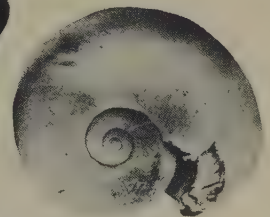
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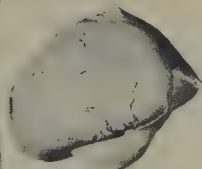
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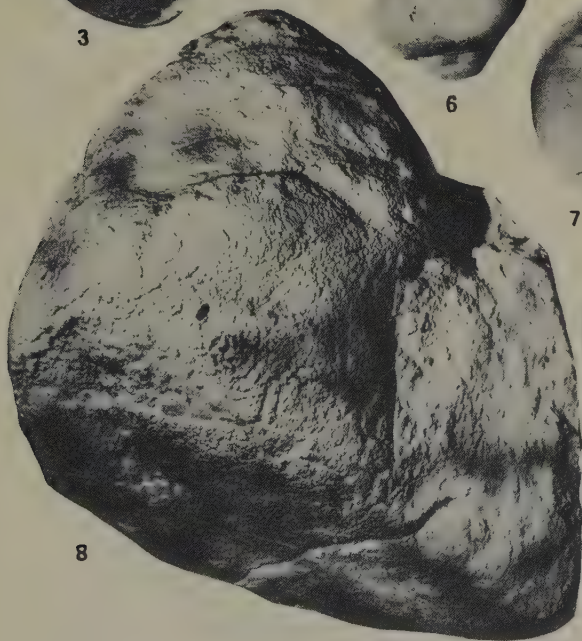
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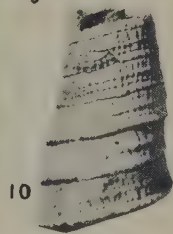
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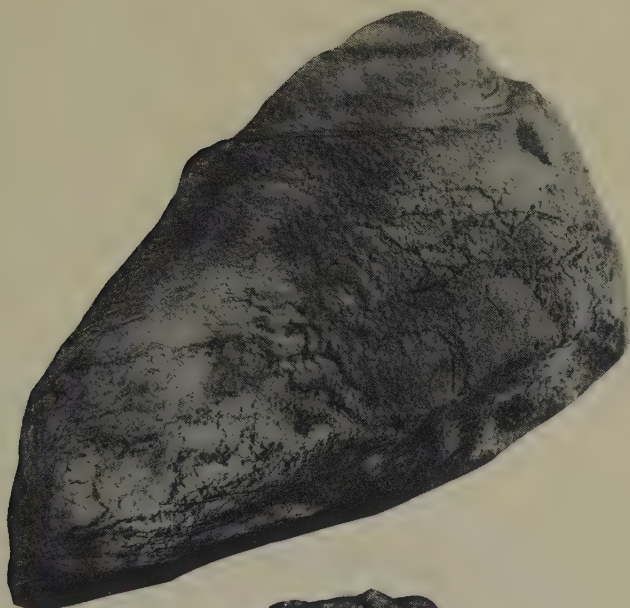


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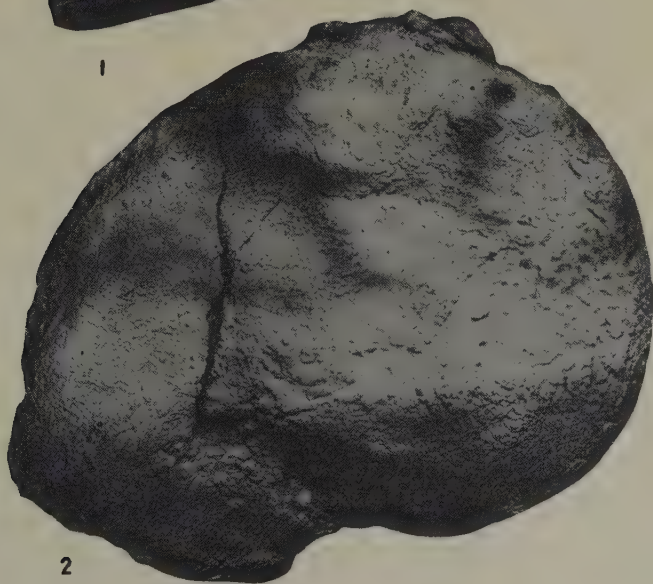
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18. *Marginella berjadinensis* F. Hodson, n. sp. Holotype, same specimen as fig. 16. 75
19. *Marginella gatunensis colinensis* F. Hodson, n. subsp. Holotype, same specimen as fig. 15. 76
20. *Marginella democraciana* F. Hodson, n. sp. Holotype from Loc. No. 70-A; length 37.6 mm., diameter 22.4 mm. 76

